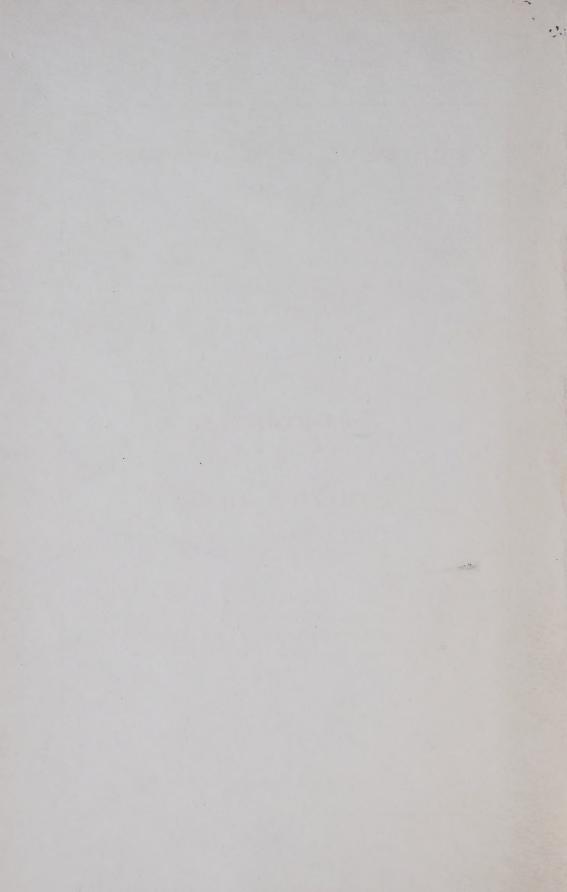
# Fisheries

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"Convettee in Fisheries, Game and Fur-Rearing Animals

## Commission of Conservation

CANADA

HON. CLIFFORD SIFTON, Chairman

JAMES WHITE, Secretary

## Sea-Fisheries

OF

## Eastern Canada

Being the Proceedings of a Meeting of the Committee on Fisheries, Game and Fur-Bearing Animals of the Commission of Conservation, held at Ottawa, June 4-5

1912

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### Members of the Commission of Conservation

The Commission of Conservation was constituted under "An Act to Establish a Commission for the Conservation of Natural Resources", 8-9 Edward VII. Chap. 27.

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HON. CLIFFORD SIFTON

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Hon. Orlando T. Daniels, Attorney General, Nova Scotia

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HON. JULES ALLARD, Minister of Lands and Forests, Quebec HON. WILLIAM H. HEARST, Minister of Lands, Forests and Mines, Ontario HON. JAMES H. HOWDEN, Provincial Secretary, Manitoba HON. JAMES A. CALDER, Minister of Education, Provincial Treasurer and Minister of Railways, Saskatchewan
Hon\_Arthur L. Sifton, Premier, Minister of Education, and Provincial

Treasurer, Alberta

Hon. William R. Ross, Minister of Lands, British Columbia

To Field Marshal His Royal Highness Prince Arthur William Patrick Albert, Duke of Connaught and of Strathearn, K.G., K.T., K.P., &c., &c., Governor General of Canada

May it Please Your Royal Highness:

The undersigned has the honour to lay before Your Royal Highness the report of the proceedings of a meeting of the Committee on Fisheries, Game and Fur-bearing Animals of the Commission of Conservation, held at Ottawa on June 4 and 5, 1912.

Respectfully submitted

CLIFFORD SIFTON

Chairman

Ottawa, Sept. 30, 1912

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OTTAWA, Sept. 28, 1912

Sir:

I have the honour to transmit herewith the report of the proceedings of a meeting of the Committee on Fisheries, Game and Fur-bearing Animals of the Commission of Conservation, which was held at Ottawa on June 4 and 5, 1912. The subject matter of the report has to do principally with the sea-fisheries of Eastern Canada.

Your obedient servant

JAMES WHITE

Secretary

Hon. Clifford Sifton, Chairman, Commission of Conservation

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## Proceedings

OF

# The Committee on Fisheries, Game and Fur-Bearing Animals

OF THE

## Commission of Conservation

AT A MEETING IN

**OTTAWA, JUNE 4-5, 1912** 

A meeting of the Committee on Fisheries, Game and Fur-bearing Animals of the Commission of Conservation was called by the Chairman, Dr. C. C. Jones, Chancellor of the University of New Brunswick, for Tuesday, June 4, 1912, and the Committee accordingly convened on that date at the offices of the Commission of Conservation in Ottawa.

## Tuesday Morning's Session

The members of the Committee present were:

Hon. Clifford Sifton, Chairman of the Commission of Conservation.

Dr. C. C. Jones, Chairman of the Committee.

Hon. J. A. Mathieson, Premier of Prince Edward Island.

Dr. Howard Murray, Dalhousie University, Halifax.

Dr. J. W. Robertson, Chairman of the Royal Commission on Industrial Training and Technical Education, Ottawa.

Others in attendance were:

Dr. Joseph Stafford, Lecturer in Zoology, McGill University, Montreal.

W. A. Found, Superintendent of Fisheries for Canada.

J. J. Cowie, of the Department of Marine and Fisheries.

James White, Secretary of the Commission of Conservation.

M. J. Patton, Assistant Secretary of the Commission of Conservation.

#### CHAIRMAN'S ADDRESS

Dr. C. C. Jones, Chairman of the Committee, presided. In opening the meeting he said:

GENTLEMEN,—I notice that the first item on the programme is the Chairman's address. That, I shall promise you, will not be a very lengthy part of the proceedings. At the annual meeting of the Commission in January last, it was thought best to reorganize the Committee to some extent and I was asked to accept the Chairmanship. It seemed to me at the time that it was essential, before anything of importance could be done, to have a meeting of the Committee at which as many of the members as possible should get together and discuss some plan of work and, further, the ways and means by which that programme could be accomplished. Immediately after my return to Fredericton, I wrote the members of the Committee, suggesting that a meeting be held during the latter part of May, and received favourable responses to my suggestion for a meeting about this time of year.

Later, I wrote to the Secretary of the Commission, Mr. White, suggesting that the Committee might devote a portion of its time to the consideration of some papers given by experts on fishery matters. I assumed that other members of the Committee were in somewhat the same position as myself regarding questions affecting the fisheries, and that our knowledge was, perhaps, not very extensive.

I therefore thought that it would be well for the meeting to spend some considerable time in receiving expert advice and, especially, in attempting to get some idea of what is being done along various scientific lines, such, for example, as fish culture and matters of that sort, which are very essential to any programme having to do with the conservation of the fisheries.

However, it was not the intention that the whole programme should be devoted to this. It was anticipated that, having listened to and discussed the papers that would be presented, we would be in a position to formulate a programme of work to be undertaken and carried out. The officials of the Commission, the Secretary, Mr. White, and the Assistant Secretary, Mr. Patton, undertook to arrange a programme and the programme that we have before us this morning is, I believe, altogether the work of these two gentlemen. I am sure that the thanks of the Committee are due to the gentlemen who have undertaken to enlighten us regarding the methods that are being adopted in fishery matters, and we ought to be able to profit by their knowledge and to formulate some plan along which the work of the Committee may be carried on.

I might note one or two matters that have been more or less before the Committee during the time that has elapsed since the annual meeting of the Commission in January last. One has reference to the culture and cultivation of the oyster and the exploitation of the oyster beds in the Maritime Provinces. Mr. Patton, a year or two ago, undertook to investigate, and did investigate somewhat thoroughly, the question of oyster production in the Maritime Provinces, especially as regards the depletion of the oyster beds and the causes thereof. Judging from Mr. Patton's report, I think there is no question that there has been considerable depletion in the oyster beds, especially of Prince Edward Island. The

suggestion that was made in his paper—and a very important suggestion it is—was that steps should be immediately taken to settle definitely the question of jurisdiction so that individuals and corporations could lease portions of the shore for oyster culture and thereby increase the production of oysters along the Atlantic coast.

The Secretary of the Commission asked the Minister of Marine and Fisheries to state to us the policy of the Federal Department of Fisheries with regard to this matter of leasing oyster beds, and he has just placed in my hands a letter from the Minister to the Premier stating, to some extent, the policy of the Federal Government on this question. It was thought by members of the Commission and this, I find, is borne out by the Minister's letter—that the provinces of Nova Scotia and New Brunswick had agreed to have the Dominion Government lease certain portions of the shore to companies that were willing to undertake the artificial production of the oyster. In connection with Prince Edward Island, it was known that at the last session of the Dominion Parliament the right of granting leases had been conceded the Province.<sup>a</sup> The view of the Commission, I am sure, would be that it is immaterial to us whether the arrangement is that the Dominion Government shall lease with the consent of the Province, or that the Province shall lease with the consent of the Dominion Government. Our contention is simply that this conflict of jurisdiction between the Dominion Government and the provinces should be eliminated, so that the oyster beds, or the prospective oyster beds, may be leased to individuals and corporations to carry on this work and thereby create an important industry for the Maritime Provinces.

I shall read you this letter from which we can form an idea of the policy of the Federal Government with regard

<sup>•</sup> The Act conferring this power is given as Appendix I on page 179.

to oyster culture. The letter was written at the suggestion of Hon. Mr. Sifton by the Minister of Marine and Fisheries, Hon. Mr. Hazen, to the Prime Minister, Rt. Hon. R. L. Borden. It is as follows:

## OFFICE OF THE MINISTER OF MARINE AND FISHERIES

OTTAWA, June 1st, 1912

My Dear Premier:-

I beg to acknowledge the receipt of the letter from the Secretary of the Conservation Commission to you, requesting a statement of the policy of the Government with respect to the retention of Federal control over the oyster fishery in Canada, and asking whether a decision has been reached to retain the fishery under Federal control, as it was understood was done last year with New Brunswick, or surrender it to the Provincial control, as was done with Prince Edward Island.

Briefly, the facts are as follow:

Some time prior to the decision of the Imperial Privy Council in the Fisheries Reference, in 1898, the Department endeavoured to encourage an industry in the cultivation and culture of oysters, and to that end certain leases were issued; but in view of the uncertainty regarding some question of fishery rights following the decision in question, practically all these leases were dropped, and this Department has not felt in a position since that time to grant any leases which would be satisfactory in their nature, to those who might be prepared to go into the culture and cultivation of oysters on areas not now producing them.

The oyster beds, and practically all areas not producing oysters, but most suitable to be turned into beds, are either in rivers, estuaries of rivers, or in the bays about the provinces and, as you know, these and indeed the territorial waters along the seacoast, have been claimed by the provinces to be under their jurisdiction.

Several efforts have been made since 1898 to reach an amicable settlement with the provinces, and the question of issuing leases for the oyster industry was consequently held in abeyance; but about three years ago, when it became apparent that there was little hope of an amicable settlement until a further decision of the Court had been obtained, the Department took up the question of a modus vivendi with the different provinces to enable it to start an industry in the culture and cultivation of oysters.

In the first instance Prince Edward Island evinced anxiety to enter such an arrangement; but later on it entirely reversed its position, and ultimately stated that it could not consider the matter further.

The question was then taken up with New Brunswick and Nova Scotia alone, and while the Commission is under the impression that an agreement was reached with New Brunswick, such is not the case. Nova Scotia did sign the *modus vivendi* on condition that New Brunswick would; but while the Government of that Province at first seemed prepared to do so, later on it hesitated, and it has not been possible to have the matter closed.<sup>a</sup>

Appreciating the tremendous possibilities in the culture and cultivation of oysters on what are now barren bottoms along the Atlantic coast, after very careful consideration of the whole matter, and as Prince Edward Island stated that it was ready to at once actively deal with the question, I concluded that it was better to have an arrangement authorized which would enable something to be done, and so break the deadlock. Consequently, an amendment was made to the Fisheries Act during the recent session, which forms Chapter 23 of 2 George V, a copy of which I enclose, and under which, following the authority of Council, an agreement has been entered into with Prince Edward Island.<sup>b</sup>

There would seem to be no reason why the same course should not be followed with New Brunswick and Nova Scotia, as well as with British Columbia, should the Governments of these provinces be not prepared to enter into the proposed *modus vivendi*; but, on the other hand, be ready to take up the question of promoting the culture and cultivation of oysters on suitable areas.

Of course, the regulations under which oyster fishing may be carried on anywhere will remain with the Federal Government, under the British North America Act.

Yours faithfully,

(Sgd.) J. D. HAZEN.

RT. HON. R. L. BORDEN, K.C., P.C., M.P., Prime Minister, Ottawa.

a This modus vivendi is reproduced as Appendix II on page 180.

b See Appendix I on page 179.

I noticed, in looking over the statistics in the Canada Year Book for another purpose a short time ago, that the Dominion of Canada imports annually more than \$350,000 worth of oysters from the United States, where, of course, the oyster supply is controlled largely by corporations which are interested in ovster farming. The cultivation of oysters in the oyster beds of Rhode Island, Connecticut, Massachusetts and other coast states is possibly one explanation of the fact that such large quantities of oysters are imported into Canada when we have our own oyster beds. Our large importations are also due to the fact that these companies in the United States are not only interested in the cultivation, but also in the shipping of oysters. They control the shipping interest to a large extent and they also have patented, I believe, methods of keeping and shipping them, so that, doubtless, when ovsters are required by hotels in Central Canada, it is more convenient to obtain them from these firms than to depend upon the uncertain supplies of the Maritime Provinces. It would be an advantage if we could conserve and develop this important industry by inducing companies of large financial resources to undertake the production and shipment of oysters from the shores of the Atlantic to supply the markets in Canada. If that could be accomplished, the industry might be retained in Canada and become an important one to our own people.

One of the matters that I assumed might well come before the attention of the Committee is the question of suggesting that this privilege granted to Prince Edward Island, of leasing oyster bottoms, might be extended to other provinces. It is a question for the Committee to consider.

A question that has been raised by the fishermen of Nova Scotia is that of the employment of beam or otter trawlers in the waters of the North Atlantic near the shores of Canada. Of course, such

trawling is prohibited within the three-mile limit; but, outside of that, there are no means of prohibiting it unless a convention were had between the nations affected.

The question of such beam trawling has been investigated to a large extent in connection with the fisheries in the North sea. I took occasion, as far as possible, to inform myself regarding the situation there, so far as that information could be gathered from British blue-books. The information is, however, somewhat difficult to obtain and more or less unsatisfactory. I found that the fishermen there were, as are the fishermen in Nova Scotia and New Brunswick, entirely opposed to the introduction of such methods of fishing. One can very well understand that their opposition may not be due so much to the beam trawler as affecting the depletion of the fisheries, as to the beam trawler as affecting their own industry in connection with their own methods of fishing and the production of fish.

The fishermen of the North sea charged that beam or otter trawlers affected the fisheries adversely in several ways. One was that it destroyed the ova of the fish. Another was that it destroyed the bottoms, the feeding grounds of the fish; and another, that it led to the destruction of the immature fish that had not yet become commercially valuable, but that were prospectively valuable. The first charge of the fishermen, that the trawler was affecting the production of fish by destroying the ova, was not sustained. In regard to the second charge, the destruction of the feeding grounds, there was some difference of opinion, although it did not seem from the evidence which was placed before the Commission that anything very serious was to be anticipated along that line. Of course, it has been suggested that the bottoms in the gulf of St. Lawrence are entirely different from the bottoms in the North sea, and that the conditions might therefore be some-

what distinct. That is true, and it suggests one field of investigation in regard to the operation of trawlers here. With respect to the destruction of young fish, it was found to be undoubtedly true that large quantities of immature fish were destroyed by the trawlers. I think this is one question which ought to be investigated. It was suggested that the size of the mesh might be increased so as to avoid the slaughter of such fish. Possibly some such provision might be made in regard to that. On the other hand, if it is found that the employment of beam trawlers does affect the feeding ground of the fish and does destroy quantities of fish which cannot be profitably marketed, it might be wise to prohibit that form of trawling altogether in the waters of the North Atlantic. I presume that that might be done if a convention were arranged between the United States and Canada.

However, that is a matter which is, perhaps, a little outside of our jurisdiction, except that it is within our province to enquire into the facts of the matter and to ascertain whether certain methods of fishing affect the production and conservation of fish in the waters of the North Atlantic. It is possible, if the contention is borne out that such trawling does affect the feeding grounds, that certain areas might be set apart wherein fishing by such trawlers should be prohibited; or some other regulations might be adopted to ensure the protection of the fish.

Another question, which, however, does not concern the fisheries, is the question of fur farming. This Committee has to deal not only with the fisheries, but also with fur-bearing and game animals. In connection with the artificial rearing of animals for fur, it was suggested last January that the Committee might be asked, through the head offices here, to ascertain just what is being done in the way of the artificial production of fur in Prince Edward Island and other parts of Canada. We

would thus be in a position to advise those who are intending to engage in the industry by finding out, as far as possible, just what the industry may be able to accomplish, what the field is, whether fur farming may be carried on profitably and under what conditions. It was thought that the Committee might employ a man who was qualified to deal with this work to investigate the conditions as they are in Canada at the present time and to write a pamphlet of considerable size dealing with the present status of the industry, and making therein any suggestions that were advisable in regard to the production of fur.

The origin of the industry was in Prince Edward Island and it was natural that we should look to the fox farms of Prince Edward Island for some enlightenment in matters of this sort. The man who has been engaged is a native of Prince Edward Island and is, at the present time, employed in the United States. He has been engaged to carry on an investigation this summer. I thought it wise to get from the Secretary some idea of the work that would be undertaken by the gentleman who is to do it, as well as the cost, in order that we might have the matter clearly before us. It might be well perhaps if I should read some extracts from a letter of the gentleman who has been employed—Mr. J. Walter Jones—so that we may have an idea of just what he proposes to undertake. This letter is from Washington and I quote as follows:

"The cost of the investigation depends on the manner of doing it. My own judgment is that ranches should be visited in every one of the four districts where fox farming has developed, viz., Prince Edward Island, Labrador, Yukon and Ontario......

Ninety per cent. of the ranches are in the Maritime Provinces; but in Labrador and Yukon they use their own methods of raising, which may be quite different from those in use elsewhere.....

According to the current prices of foxes those in captivity on Prince Edward Island are now worth about \$3,000,000. Their fur value next December would be only about \$1,500,000. There is danger in such

speculation and the truth about the business should be found out and the facts published. It will be found that there is a basis for a good industry; but the present speculative prices will break to less than half. If, mink, marten and otter can be reared, as is being attempted, an excellent industry, diversified in production, can be developed, which will net millions yearly for Canadians.

The expenses in connection with this investigation are not excessive, the estimate being \$1,360. The total cost will exceed that somewhat; but I think the work promises such a valuable return that the sum involved will not be ill spent.

These are the important matters that have arisen in connection with the Committee since last January. There is just one other suggestion that occurs to me in view of the matters that need investigation from time to time. There is abundant material requiring investigation to require the services of a good official who will represent the Committee. carry on investigations and make reports from time to time on all matters respecting fisheries and game and fur-bearing animals which come under the purview of the Committee. In connection with the fisheries, the investigations would generally be carried on during the summer, while, in connection with game and fur-bearing animals, they could be carried on during the winter. I think there is much ground to be covered and abundant material at hand to necessitate the employment of a man who is an expert. I merely suggest that, before we adjourn, we make a recommendation that such an official be secured, if possible, and set to work upon the problems which are now before the Committee. The gentleman who is to investigate fur farming is simply employed temporarily for three months. That will not affect the employment of a permanent official who will undertake to carry on investigations under the direction of the Committee and especially in connection with the fisheries. If the Committee feel it wise to recommend that an appointment be made, I am sure that the recommendation would be considered by the Commission and acted upon favourably. This is all I have to offer in the way of remarks at the present time.

The next item on the programme is a paper by Mr. Patton on the "Whitefish of the Great Lakes."



## Whitefish of the Great Lakes

By M. J. PATTON

Assistant Secretary of the Commission of Conservation

I have had but little more than a day in which to prepare the remarks I am about to make on the whitefish fisheries of the Great lakes. Consequently, less time has been put upon what I have to say and how I am to say it than the importance of the subject merits. I shall endeavour, however, to give at least an introduction to the subject, and am sure that our friends from the Department of Fisheries whom we have with us will be only too glad to supply any information desired on points upon which I do not touch.

In dealing with a subject of this kind it is always desirable to recall the chief habits and characteristics of the fish under consideration, because the policy to be adopted in conserving the supply should be based upon these facts of natural history. There are just two or three points of this kind with regard to the whitefish that I would like to mention. One is that it is a bottom feeder, living on the small crustacea and molluscs on the floors of the lakes, and migrating shoreward to shallower water only in June and July in order to feed on the insect larvæ that are then numerous, and in the month of November to spawn. The depth at which it is usually found varies from ten to thirty-five fathoms. From a knowledge of this fact and also from a careful study of its movements, scientists have been able to tell just what areas are inhabited by this fish. These areas for each of the Great lakes have been plotted on the maps which you see on the wall. You will notice that the waters in which the

a These are reproduced herewith.

whitefish occurs are those of moderate depth parallel with the coast line. The areas inhabited on each side of the lakes are separated, except in the case of lake Erie, by a stretch of deep water.

But perhaps the most important characteristic of the whitefish from our point of view is that it is local in its habits—that is, its movements are pretty well confined to a limited area of water. From this a very important corollary follows, viz., that we must hold ourselves responsible for depleting our own waters of this fish. We cannot say that the whitefish are disappearing from our side of the lakes because the United States fishermen are catching them all, for these fishermen are not allowed on this side of the international boundary line. Moreover, when this fact is known, we may rest satisfied that when we plant fry on this side of the lakes the fish into which they grow will be caught by Canadian fishermen. Because we cannot get our neighbours to agree to international fishery regulations is no reason why we should not conserve our own whitefish supply.

An Excellent Vicinity of the Great lakes knows what the vicinity of the Great lakes knows what the common whitefish is like. The average specimen weighs from about two and a half to three and a half pounds and is easily distinguished by its white glistening appearance and its unusually large scales. Other outstanding characteristics are its little mouth and its small head, the latter appearing much smaller than it really is on account of a large fleshy hump at the shoulders. The whitefish is especially noted, however, for its fine flavour as a table fish. The early explorers on the Great lakes, who had to live on a fish diet for months at a time, stated that it was unlike other fish in that one never lost one's relish for it. In fact, from the earliest times, it has been known as "America's finest food fish."

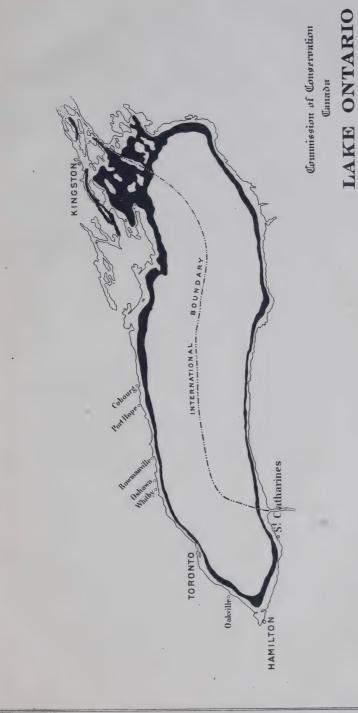




of the Great Lakes,' in Bull. XXVIII, U.S. Bureau of Fisherles, (Reproduced from 'Plans for promoting the Whitefish Production LAKE ERIE
Whitefish area (shown in black) 12-30 fathoms Commission of Conservation Scale, 35 miles=1 inch Canada Windsor

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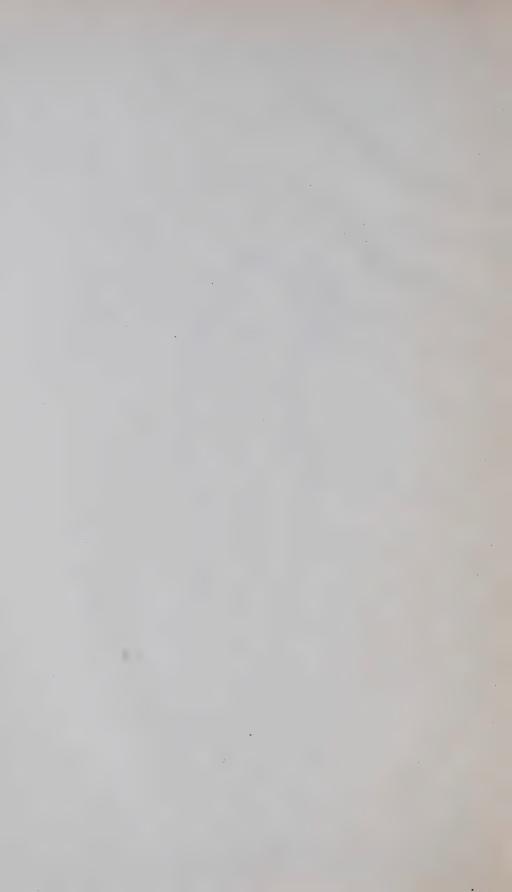




Whitefish area (shown in black) 10-20 fathoms

Scale, 35 miles=1 inch

(Reproduced from "Plans for promoting the Whitefish Production of the Great Lakes", in Bull. XXVIII U.S. Bureau of Fisheries.)



As a result of its fine table qualities it is much sought after—so much so, indeed, that the supply is never equal to the demand. The price at which it is sold gives some indication of its popularity. In the twenty-year period, 1890-1909, the average price was eight cents a pound, while for the last two years it has advanced to an average of about twelve cents. In Chicago, specimens weighing four and half pounds or more sometimes sell at twenty-five cents a pound wholesale. The retail prices are, of course, much higher. Both on account of the good price obtained by the fishermen for whitefish and because of its acceptability as a food fish, it is very desirable from an economic point of view that the supply be not only maintained, but, if possible, increased.

### THE CONDITION OF THE FISHERY

This leads us to ask whether the present The Supply catch is as large as it used to be in each of the Great lakes, and also whether the trend of production is upward or downward. There is an old saying that figures don't lie, but liars can figure; and it is never more true than when applied to the fisheries. The catch of any kind of fish is often abnormally highin one year and very low the next and it is exceedingly easy for a person, by selecting particular years to give a very misleading idea of the condition of the supply. To ascertain just what the trend of production is in the case of whitefish I have considered the statistics from 1886 to the present time, and to arrive at a fair conclusion have grouped the catch in five-year periods and computed the average from each of these. This will prevent an abnormally good or an abnormally bad year distorting the view so as to give an erroneous impression of the condition of the fishery.

<sup>&</sup>lt;sup>a</sup>The whitefish caught in Manitoba waters bring a lower price than those taken in the Great lakes.

The statistics for Canada as a whole, which include the catch in the Great lakes, the smaller lakes of Ontario and the waters of the Prairie Provinces and of the Yukon, show that the average yearly catch for the past five years (1906-1910) was eleven million pounds, as compared with about nine million pounds for the five years from 1886 to 1890. But the average catch of eleven million pounds for the past five years is six million pounds less than it was for the five years from 1891 to 1895. The trend for the whole of Canada for the past fifteen years has therefore been downward, although the production at present is greater than it was twenty years ago.

But this is for all Canada. The production of the Prairie Provinces is much greater at present than twenty years ago, so that the catch now in the Great lakes is not as good as the comparison just made would lead us to believe. As a matter of fact, we must consider each lake separately if we are to arrive at a conclusion that is both useful and accurate regarding the increase or decrease of production. The whitefish may be increasing in one lake at the same time as they are decreasing in another. I have compiled such statistics, taking the average of every five-year period for each of the Great lakes. And what are the results shown? They are rather startling:

- (1) In lake Superior, the average yearly catch twenty years ago (1886-1890) was more than twice as great as the average for the past five years (1906-1910). Since 1894 the trend has been rapidly downward.
- (2) In lake Huron and Georgian bay, the catch twenty years ago was nearly three times greater than it is now. The decrease begins with 1893.
- (3) In lake Erie and the Detroit river, on the other hand, the average catch to-day is nearly four times as great as twenty years ago.

(4) And in lake Ontario, too, the average catch now is somewhat less than twice as great as a score of years ago.

These figures disclose conditions that must be heeded. In the two upper lakes the trend of production is downward. Lake Superior does not produce half as many whitefish as it did twenty years ago, and lake Huron and Georgian bay only about a third as many. But in the two lower lakes the catch has been increasing; lake Erie, together with the Detroit river produces nearly four times as much, and lake Ontario almost twice as much, as twenty years ago.

### RECUPERATIVE MEASURES

In view of these figures we are led to ask what Canada has been doing to increase the supply of this fish in the Great lakes. There are two means by which the supply of fish may be increased, one restrictive, the other constructive. A government may enact laws saying that at certain periods of the year, no one may take fish, or it may prohibit the use of especially destructive fishing gear or establish a size limit below which no fish may be taken or sold. The enforcement of such measures leaves the fish undisturbed and the supply increases by natural methods. Or, on the other hand, the public authorities may breed fish themselves and put the fry in the waters to replenish the supply. In the case of the whitefish, the Dominion Government has adopted both restrictive and restorative measures.

Let us see just what of the former kind have been put in force. There is only one,—the close season, which lasts during the whole month of November. During that period no one may take fish in any of the waters of the Great lakes, except lake Erie, which, beginning this year, has no such protection. In regard to the manner of enforcing this close season, the Government has been subjected to some criticism. For instance, many

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complaints have been made that poaching is rampant on lake Superior because the fisheries protective officers are not provided with efficient means of moving about quickly from place to place. Then, the officials of the Ontario Fisheries Department, who have to administer the laws made by the Dominion, are especially critical about the gradual abolition of the close season on lake Erie, which culminated this year in the total elimination of that season. principal objection raised was that the abolition of the close season in waters fronting on certain counties made it impossible to enforce such a restrictive measure in the other counties. Whenever any whitefish were seized for being caught illegally, affidavits were readily forthcoming to the effect that the catch had been made in the exempted counties. Now that the close season on this lake has been completely abolished such an objection cannot be urged.

Various ideas prevail among fish experts with respect to the close season for whitefish. Some claim that there should be several close seasons varying with the latitude, because it is known that in the colder waters of the upper lakes the spawning season occurs about fifteen days later than in the warmer waters farther south. Others, again, would abolish it altogether, substituting a size or weight limit below which no whitefish could be legally caught or sold. Mr. F. N. Clark, an eminent United States fish expert, has still another plan. He would allow the catching of whitefish during the spawning season when the meat is at its best, but would prohibit their capture when the largest lifts of unripe fish were usually made, compelling the fishermen to strip every ripe female during the spawning season, fertilize the eggs and hand them over to Government hatcheries for hatching. This plan, however, presupposes the existence of large hatchery facilities, and under present conditions could not be adopted by Canada.

So much for restrictive measures for increasing the

supply of this fish. Now let us see what restorative measures are being taken by Canada to prevent depletion. If the eggs produced by every adult female whitefish developed into fish, there would be no need of artificial fishbreeding operations. The average female produces about 35,000 eggs every year, but gives them off without any thought of the proximity of the male. The consequence is that only about one per cent, or 350 out of the 35,000 eggs, are ever fertilized; for an unfertilized whitefish egg lives, at most, less than four minutes after being voided. Once fertilized, the egg lays on the bottom for from 128 to 150 days, and if, during that time, it escapes being eaten up by other fish or being killed by sewage or industrial wastes, it becomes a small whitefish ready to fend for itself. Under natural conditions about 11 per cent of the fertilized eggs hatch out. Now, in the hatcheries, from 75 to 80 per cent. of the eggs are successfully hatched, so that man is about seven times as efficient as Nature in the business of hatching whitefish.

There are two reasons why man must come to the aid of nature in maintaining the supply of this fish. The first is over fishing. The demand for whitefish is so great that the natural supply is speedily depleted. The second is that the whitefish has not now the facilities for breeding that it had before civilization pressed so close upon the shores of our Great lakes. A large area of the spawning and feeding grounds has been destroyed by industrial wastes, especially by sawdust; and from other areas the sensitive whitefish has been driven away by sewage-polluted waters. Modern conditions make it imperative that fish breeding operations be undertaken to prevent the depletion of our waters of this fish.

In dealing with this matter of the culture of whitefish we are fortunate in having at our disposal the results of extensive observations made by Mr. Paul Reighard, of the University of Michigan, regarding the relation of the number of fry planted to the resultant increase in catch. As a result of a survey of cultural operations in both Canadian and United States waters of all the Great lakes, Mr. Reighard found that a plant of 20,000 or more whitefish fry per square mile of whitefish area gave a considerable increase in catch per unit of area; that a plant of 5,000 to 10,000 fry produced a moderate increase in the catch; while a plant of less than 3,500 fry resulted in a diminished yield.

That is our criterion for judging the effectiveness of Canadian fish-breeding operations. Let us see whether, according to it, we are planting enough whitefish fry. In lake Superior we are planting no fry at all—result: the catch now is less than half what it was twenty years ago. In lake Huron and Georgian bay the average plant for the last five years has been only about 700 a year per square mile of whitefish area, and the catch in those waters is only about a third of what it was twenty years ago. In lake Erie the average plant has been about 30,000 per square mile, (you will recall that Reighard said a plant of 20,000 was necessary to produce a considerable increase in yield) and the catch has almost quadrupled in the last twenty vears. In lake Ontario the plant has been comparatively small—about 3,000 on an average for the last five years but the vield has increased nearly twice over what it was twenty years ago. This is probably explained by the light fishing preceding 1906, for the average catch for the five years 1901-1905 was only 139 pounds per square mile of whitefish area as compared with 279 for lake Huron and Georgian bay.

The general conclusion to be drawn from these facts is that the planting of fry in sufficiently large quantities in the Canadian waters of the Great lakes has undoubtedly resulted in an increased yield of fish. This is plainly shown in the case of lake Erie where, not-

withstanding the heavy fishing (an average of 594 pounds per square mile of whitefish area for the last five years) the large plant of young fry has resulted in almost quadrupling the catch as compared with twenty years ago. On the other hand, the catch in lake Superior, where no fry has been planted, and in lake Huron and Georgian bay, where a very small plant has been made, shows an alarming decrease.

If a plant of whitefish fry as large as that made in lake Erie were made in these waters, I have little doubt that there would be a most appreciable increase in the catch within a few years' time; and I think it would be in keeping with the functions of this Committee to call the attention of the Government to the rapid decrease in the whitefish production of these two lakes and to suggest that extensive plants of fry be made to remedy the depletion.

#### DISCUSSION: WHITEFISH OF THE GREAT LAKES

Dr. Jones: The excellent paper with which Mr. Patton has favoured us is now open for discussion. It is not necessary that the discussion should be limited to the members of the Committee. Other gentlemen present are cordially invited to join in it. If there is any gentleman present who has any remarks to offer, we shall be glad to hear him.

I suppose there has been more or less migration from one lake to another?

MR. PATTON: No. It seems pretty well established that whitefish are quite local in their habits, even in a lake in which one might suppose there might be migration from one side to the other; such, for instance, as in lake Erie, where the international boundary line runs almost through the centre of the whitefish area.

Dr. Jones: It is stated that there has been an increase of whitefish in lake Ontario where planting has not been

done on a large scale. Might not that be possibly due to the fish coming from lake Erie?

MR. PATTON: Scientists who have closely studied the habits of the fish agree that it is not migratory in its habits and that, even allowing for its shoreward migrations in the summer and the autumn, it does not roam over a large area. In any case, I do not know whether they would venture over the Falls.

It was only in 1908 and 1909 that the increase was marked in lake Ontario. Before that the production was only a third of what it was in 1909, and in 1910 it declined again. It has been said that the fishermen largely went out of the business owing to the limited supply available, and this might be one of the causes contributing to the increase now.

DR. STAFFORD: I would like to ask Mr. Patton if there is any reason for the whitefish being restricted to the black portion of the chart showing lake Erie? Does that represent shallower water than elsewhere?

MR. PATTON: These charts are taken from a paper prepared by Mr. Paul Reighard of the University of Michigan and the areas delimited are the result of taking soundings and of questioning the fishermen. Mr. Reighard, I understand, conducted a very thorough investigation, and as a result, he found that whitefish had been caught only on the area shown in black.

MR. WHITE: The solution is that lake Erie is the shallowest of all the Great lakes.

Dr. Stafford: And that portion is the shallowest portion of lake Erie.

Mr. White: Not exactly the shallowest part; but it is the portion below 60 feet.

Mr. Patton: Mr. Reighard gives the depths at which whitefish are found in lake Erie as from 12 to 30 fathoms.

Mr. Cowie: Is there any difference between the white-fish of lake Erie and those of lake Ontario?

Mr. Patton: Yes. The whitefish in lake Ontario, especially in the bay of Quinte, are a larger-scaled variety.

Dr. Stafford: Are they not of a different species in lake Ontario from those in lake Superior?

Mr. Patton: No. I have been dealing entirely with the common form of whitefish (coregonus clupeiformis).

Dr. Stafford: I know that the whitefish brought to the Montreal markets are of a different species from those sold in Toronto.

Mr. Patton: There are two other kinds of fish—the blackfins and the longjaws,—which are really not true whitefish, but which are commonly called such.

Dr. Murray: I would move that the suggestions offered by Mr. Patton at the conclusion of his paper, be adopted by this Committee and a recommendation made to the Department accordingly.

Dr. Jones: Would it not be better to have a definite resolution written out and submitted along with all the other resolutions this afternoon?

Dr. Jones: The next paper on the programme is one by Dr. Stafford on "The Conservation of the Oyster."

Dr. Stafford: As a preliminary, I should like to state that I expected merely to speak on this subject, and it was only a few days ago that I received a letter requesting me to give a paper. So I went to work and wrote out the important things about which I was going to speak. While this will be but a cursory treatment of a good many points

in connection with the oyster, still I think it will bring us into contact with most of the important things, and if there is any other point that you would like to have discussed more explicitly, I will be very glad to try to do so.

It is rather difficult to treat the subject of the oyster without using a few technical terms, and it may be that I shall use a technical term or two that may not be familiar to some gentlemen present. If so, I wish you would ask me to explain it.



# Conservation of the Oyster

By Joseph Stafford, M.A., Ph.D. Lecturer in Zoology, McGill University

AVING been asked to speak on the oyster before the Commission of Conservation, I considered it appropriate to select that portion of the subject which falls in line with the work of the Commission. This appears all the more desirable, since, on the one hand, the present-day knowledge of the oyster has grown too extensive to be encompassed in a short address and, on the other hand, because of the widely prevailing opinion that the oyster is dying out.

Different problems have to be attacked in different ways: the methods for the conservation of the forests are not applicable to oysters; and yet there are certain aspects in which they are similar. Mere retention of natural resources serves no very beneficial purpose: they should be used to employ, sustain and enrich the people. Preservation and use are to a large extent opposed; the intermediate course is to economize, to make go as far as practicable without waste, to turn to the most necessary and valuable uses, and at the same time try to bring on a fresh supply.

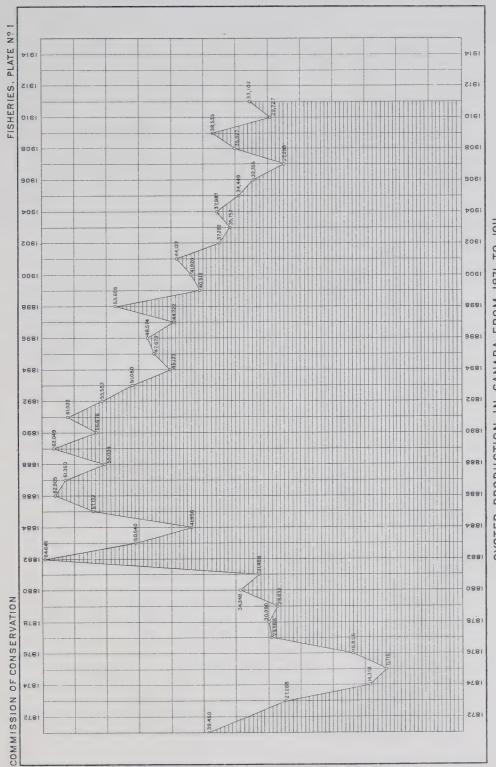
Oysters are a food, not a fertilizer. They are not only a food, but a luxury; yet they were once burned for the small amount of lime yielded, and there was a period of considerable strife as to whether they should belong to the fishermen or the farmers. In the meantime the extension of trade and the rise in price decided the controversy and created a demand which excited search for new beds until all our oyster areas had been explored.

### THE PROCESS OF DEPLETION

Statistics taken from the reports of the Department of Marine and Fisheries show that the production reached its maximum in 1882, from which date there has been a gradual decline. Places that were at one time prolific now yield no oysters. In some districts the season's catch is nearly all taken on the first day of open fishing. It is no uncommon spectacle to see fleets of boats assembled over promising areas waiting the hour to start. The opinion of fishermen, the comparison of the catches of different years, the examination of particular localities, all point in one direction—that the fishery is failing and there is danger of its complete extinction.

This is not surprising. It has been the history of other places and of other fisheries. Under primitive conditions, before the intervention of man, nature settles into a sort of equipoise whereby the losses due to the accidents of life are made good by reproduction. The number of individuals remains about the same from year to year; but in order to maintain this balance, the female oyster is called upon to deposit something like 16,000,000 eggs every year of her adult life, which goes to show the magnitude of the death rate and, at the same time, the magnitude of the causes which operate to bring about such a death rate.

There are limitations in the kind and the ability of the oyster to make use of it, in the climatic, physical, and biological conditions of the environment. The heat of the sun, cold, frost and ice, river water, tides, currents, storms, drift, sediment, weeds, parasites, carnivorous animals, disease and old age have their effects in reducing the numbers. Eggs may go unfertilized, larvæ may be thrown upon the beach or drifted out to sea, spat and adults may be smothered in mud, eaten by crabs or fish, or injured by competition. Against these and such like forces, that have been in operation for century upon century, the oyster is fitted by nature to hold its own.



OYSTER PRODUCTION IN CANADA FROM 1871 TO 1911
Figures denote number of barrels



But where man interferes, with his How Man reasoned methods of fishing and his selfish Destroys disregard for the future of the fishery, he disturbs the balance which has obtained between the natural and opposed powers of production and destruction, and in a comparatively few years reduces the productivity of the natural beds to the verge of depletion. The oyster, in its simple, undesigned, mechanical mode of life, hampered by all its specializations and loss of sensory and locomotory organs, cannot evade or defend itself against the persistence and the contrivances of man. If the oyster could reason, it would regard man as its greatest enemy; for he not only calculatingly takes every specimen that can be found, but in various ways destroys others that he cannot see, and almost maliciously interferes with all stages of the developing young. In the first place, he strikes at the very existence of the oyster in fishing for and removing from the beds the full-grown breeding individuals and those next in size that should take their places. In doing this he removes spat on the adults that are too small for use and should be left in the water where they can grow up. At the same time the removal of all these reduces the amount of natural cultch. The process of fishing cannot help but break down the surfaces of the beds, burying living oysters under dead shells or tumbling them into mud. In a similar manner the fishing for quahaugs interferes with oysters and spat, and stirs up mud in the water which settles onto the surfaces of shells, rendering them unsuitable for the attachment of larvæ. In all this the fisherman's influence on the oyster is one of destruction, injury, hindrance, for which he makes no amends. To pursue these practices would mean ultimate extinction.

In order to prevent such a calamity, the legislature has imposed certain restrictions upon the fisherman, limited the time, place, and manner of fishing, the size of the oyster to be taken, the damage and obstruction to the beds. The effect has been to check the rate of decline by reducing waste and injury, and in a measure, to prolong and preserve the fishery. This is making the most of what nature has supplied us free and unassisted. Under this method the fishery is declining, the oyster is dying out.

#### METHODS OF INCREASING PRODUCTION

From this brief review of the forces of destruction we must turn to the methods of production and seek for a means to multiply the number of marketable oysters without having to restrict the catch.

The sea is not illimitable and its products are not inexhaustible. Man cannot expect continually to get something for nothing from it. Not satisfied with the natural productions of the land, he has set himself to the destruction of the more useless and the increased cultivation of the most useful. He must do the same with regard to the sea. It may be a long time before man gains anything like a satisfactory control over the most valuable migrating fishes; but it is very different with the oyster, which has lost all power of locomotion except for a brief larval period. It would seem almost to have been expressly designed to lead man from the cultivation of the land to that of the sea. The only way in which materially and effectively to increase the number of oysters is to expend labour in extending and improving the natural conditions that are known to be necessary or favourable to its existence.

Life History of the Cyster In order to expend labour intelligently and advantageously upon the oyster or upon its environment, it is necessary to know its complete life-history and to know the natural conditions favourable to each different stage—egg and embryo, larva, spat and adult. Until recently there was at one place a great gap in the continuity of our knowledge; but this, through Canadian

research, is now bridged over, and we are therefore in a position to judge better than ever before of how, when, and where to best render assistance to the oyster.

The assistance, in its nature as well as in its manner of application, depends especially upon a knowledge of the natural conditions of existence, the modes of propagation, and the methods of culture.

The natural conditions of existence are either extrinsic, i.e., outside the oyster and reacting upon it, or intrinsic, i.e., within the oyster and fitting it to withstand or make use of external forces. Extrinsic conditions are either physical or biological—physical when they refer to the habitat, biological when they refer to competition and food. Intrinsic conditions are either anatomical and physiological or embryological and developmental—the first when they refer to the structure and activity of the oyster, the latter when they refer to (1) the egg and pre-larval stages, (2) the larval or free-swimming stages, (3) spat to adult stages.

The modes of propagation are either natural or artificial—natural when the eggs are regularly spawned into the sea-water and develop in the usual way, subject to the exigencies of life; artificial when the eggs are taken from an oyster and fertilized by sperm from another oyster while the products are kept under the control of man.

The methods of culture of the oyster do not start with the simplest stage, the egg, as is common in the culture of most living things. In the cultivation of plants it is usual to begin with the spore or the seed. In the raising of fish, birds, and many other animals it is the rule to commence with the egg; but with the oyster it is the custom to start with the spat that is already considerably advanced towards maturity. Oyster culture, as generally carried on, is about on a par with the transplanting of fruit trees obtained from a nursery, and looking after them until they

are full-grown. This is the reason why oyster culture has been known since early in the historic period, although the egg and first stages of development were not discovered until comparatively recent times. It might easily happen that anchors, ropes, stakes or other objects left in the water of oyster regions, could receive a deposit of spat, and, acting upon the observation of such an occurrence, somebody began to put out things for the purpose of catching spat. As experience accumulated, a nearer approach to the time of spatting could be arrived at in the putting out of cultch. In such a manner a practical method could be developed without any knowledge of what was really taking place.

The methods of oyster culture as practised Methods of in different countries are essentially the same, the differences arise principally in the material with which culturists have to work. The Englishman may throw dead oyster shells on the bottom for cultch; the Frenchman may use tiles; the Italian may suspend twigbearing ropes in the water; the Jap may employ stakes of bamboo with their branches and leaves. They all accomplish the same object in the capture of minute, young spat, that after a time become large enough to be observed and handled and can be separated and transplanted to where they have more room for growth. For the culturist there is much to be learned from the extensive literature on this kind of oyster culture in Italy, France, Holland, England, the United States and other countries.

Oyster culture in the broadest and most complete sense first became possible when Brooks (1879) of Baltimore invented the method of propagation by artificial fertilization, of the eggs of the American oyster. The method was taken up and applied by Rice, Ryder, Winslow, Nelson and others, with a view to rearing the larvæ obtained in this manner, to adult marketable oysters. Ryder became especially enthusiastic and carried out extensive experi-

ments and wrote numerous articles of which one was entitled "The Oyster Problem Solved." Nelson has been experimenting in New Jersey since 1888 and, according to his own statement, 1906, "The ultimate aim of our experiments is to make it possible to raise oysters by artificial fertilization in hatcheries, just as is now done with fish."

In 1904, while working at Malpeque, A Recent P.E.I., on the development of the oyster, I Discovery made discoveries which throw new light on the possibilities and methods of oyster culture. Previous to that time the earliest stages of development were known only from the egg (measuring about one five-hundredth of an inch in diameter) to the young larva of about twice that size, and representing a period of growth of about six days. The next stage known was the youngest spat, of five times the length of the previous stage, and about one month old, reckoning from the time of fertilization. There was a period of about three weeks in the life of the young oyster that was not known. During this time it swims about in the water, creeps or rests on the bottom, feeds, grows and develops its organs. The points of importance, from the standpoint of oyster culture, are to know when, where, and how to procure and observe the larvæ during this period; because it is the period immediately previous to spatting, and, if we can keep track of their progress, we can determine the best time to put out cultch.

The larvæ may be procured by dragging a fine net, made of bolting cloth, behind a boat over oyster beds. Water filters through the net but many small particles are collected in it. Examination of the contents with a microscope shows oyster larvæ among many other things. It is possible, by examining collections every day or two, to follow up the growth of the larvæ to the time when most of

a Forest and Stream, 1883.

them are large enough to settle onto shells, stones or other objects and become attached as spat.

It is well known that cultch to be successful in the catching of spat must be clean and fresh. After it has been in the water a few days, it becomes coated with slime and sediment to such an extent that the larvæ can find few or no spots upon which they are able to fix themselves. It is on this account that old oyster shells are taken out of the water and dried and bleached in the sun to prepare them as good cultch. Observation of the success or failure over a long period of time has narrowed down the date for putting out cultch to the latter part of June or the first week of July. Sometimes oyster culturists strike the right time, sometimes not. If they do not, there is a great loss of labour as well as the failure to get "seed." Winslow (1884) wrote: "Thousands of dollars would be annually saved by the Connecticut oystermen if they could determine, with any approximate accuracy, the date when the attachment of the young oyster would occur. Hundreds of thousands would be saved if they had any reliable method of determining the probabilities of the season."

An expert, instructed and qualified in the method, can tell, almost to a day, when is the proper time to plant shells. The three most important events in the life of the oyster, of practical use to man, are: (1) spawning or depositing of the eggs; (2) swarming or swimming of the larvæ, (3) spatting or fixation of the full-sized larvæ onto shells, or other objects. From the position of oysters below water, as well as from the small size of the eggs, larvæ, and young spat, these three events cannot be directly observed, but they can be determined by carrying on a series of observations. The time of spawning may be arrived at by examining the genital organs of adult oysters to see when the eggs are ripe. The time of swarming may be found by examining the catch of the

plankton net. The time of spatting may be determined by examining natural or improvised cultch to observe if there are any young spat already formed. The first plan is not very useful because it comes too long before the best time for putting out cultch. The last is not very practicable because, if spat are already formed, it may be too late to secure a good catch. The second is the only practicable and conclusive method because it is possible to take daily catches and to follow the growth of the larvæ right up to the time for spatting. This almost removes the process of catching spat from the region of doubt, caprice. and chance to that of expectancy, regularity and certainty. It makes oyster culture as sure as farming. It does not start at the same place as the artificial method that has not proved successful, nor at the same place as the historic cultural method which has been so long in use. But it takes account of both and begins between them just in time to strengthen the one weak point in the latter. It takes advantage of the immense number of larvæ lavishly provided by nature to offset the exigencies and accidents of life and ensure a reasonable chance of keeping up the stock. It places in their way clean prepared cultch best fitted for their requirements.

As a general method, it may be proposed to observe the natural conditions of existence—both extrinsic and intrinsic—of the oyster and of each different stage of its development. Distinguish the useful from the detrimental in its environment. Endeavor to increase and improve the former, decrease and remove the latter. Assistance may be given (1) to the oyster or its developing stages, (2) to its environment. The best outlook appears to be to increase the set of spat. To this end prepare new beds and extend old ones, supply them with spawners, and have ready an abundant supply of cultch. By the method described determine the time of maximum spatting

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before planting the cultch. Leave undisturbed for a few weeks to let the spat grow. When large enough separate and transplant to where there is plenty of room and an abundance of food. Remove sediment, weeds, enemies.

To accomplish this, oyster fishermen must Clear Titles become oyster farmers. They cannot expect to troop to the oyster beds and carry away a bounteous harvest without assisting in its production. Hitherto there has been no inducement for fishermen to expend labour upon the beds because others would join in the fishing and reap the benefit of their labour. What is required is to be able to obtain a freehold tenure or a long lease to water areas in a similar way to that by which land areas may be acquired, to have these areas surveyed and marked off, protected as private property and exempted from close season and other restrictions. Other areas not so held may be regarded as public property and be subject to regulations as at present. With this encouragement many fishermen and farmers may be induced to take up oyster culture as an industry and devote their labour and their earnings to the improvement of oyster beds, the increase of the production, the benefit of the trade, and the supply of a wholesome food. To facilitate and encourage these undertakings require that adjustment between the Dominion and Provincial Governments necessary to the granting of private rights and legal protection to oyster farms.

In addition the Government could originate ate a campaign of education for fishermen, farmers, culturists, overseers, traders, shippers, or others concerned, with regard to the importance of the new departure and the best methods to be used, as well as give a demonstration on a large scale of how to conduct the operations and to prove their value. It might institute an experimental oyster farm to continue the investigation

of oyster questions, to test the application of suggestions, and to reduce cultural knowledge to a system.

In this connection, I may mention the transplantation by the Dominion Government in 1896 and in 1905 of small numbers of Prince Edward Island oysters on the Pacific coast. Last summer I had an opportunity of examining some of the survivors and found them growing and breeding, which proves their adaptability, and the advisability of making extensive transplantations to various parts of the coasts of our maritime provinces.

ILLUSTRATION OF THE DEVELOPMENT OF THE OYSTER BY SELECTION OF A FEW CHARACTERISTIC STAGES  $^a$ 

Figures 1-5.—Egg and Segmentation (Embryonic or Prelarval) Stages.

- Fig. 1. The egg as spawned into the sea. It is spherical, or nearly so, and measures  $\cdot 05$  mm. ( $_{5}$  $^{1}$  $_{0}$  inch) in diameter. It is bounded by a membrane and contains protoplasm and a nucleus.
- Fig. 2. The egg is preparing for division and has extruded the first polar body.
- Fig. 3. Beginning of the process of cell division. The upper half divides into cells (blastomeres) first.
- Fig. 4. A later stage showing a number of cells already formed.
- Fig. 5. The increasing number of upper cells (ectoblast) almost surrounds the lower remnant of the egg (endoblast). As the cells become numerous they are reduced so much in size as to be difficult to see, and they arrange themselves to form the organs of the embryo.

## FIGURES 6-12.—Larval or Swimming Stages

Fig. 6. First free-swimming stage of the larva. Two superficial organs are visible—the ectoderm, forming a

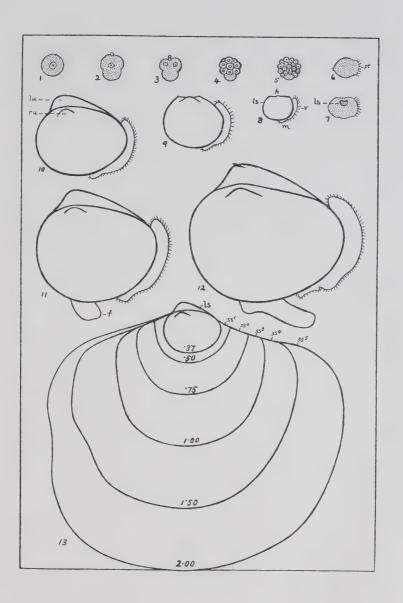
<sup>•</sup> By Dr. Joseph Stafford.

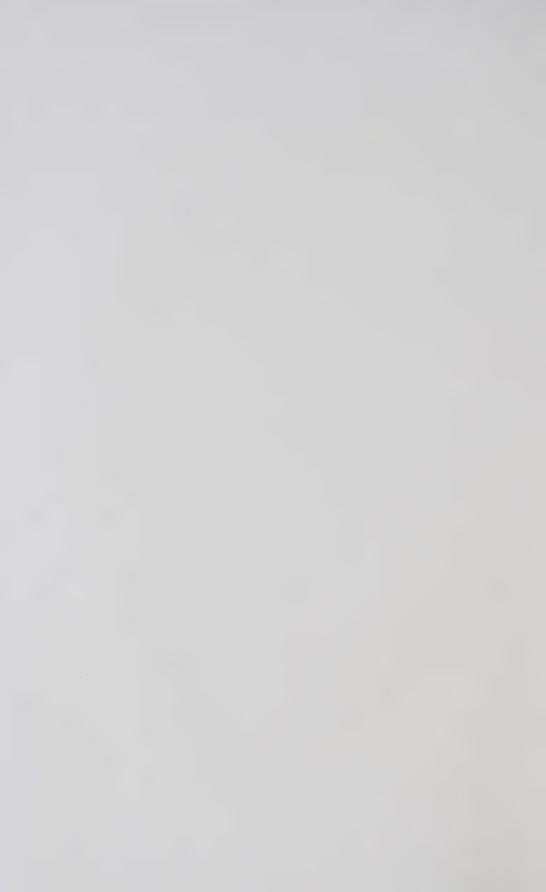
sort of surface skin, and the prototroch (pt) or swimming organ, bearing cilia in rapid vibratory movement. The swimming is a to-and-fro, circling, or spiral movement continuing for short intervals. There are internal organs such as an intestine; but up to this period the little animal has taken no food, all its matter having originated in the egg. Afterwards, it begins to swallow food and to grow. Under normal conditions of temperature, salinity, etc., such as occur about the first of July, this stage is arrived at in about five hours from the time of spawning.

- Fig. 7. The first appearance of the larval shell (ls).
- Fig. 8. The shell is grown large enough to enclose the body of the larva. It is composed of right and left valves connected together along the dorsal surface by a straight hinge (h). The prototroch is converted into a more capable swimming organ, the velum (v). The mouth is situated at m.

Stages like this may be raised artificially from fertilized eggs, but can rarely be carried farther. The natural history of the succeeding stages (8 to 12) are the author's most important contribution to the embryology of the oyster. They can be procured by dragging a plankton net through the water above oyster beds in July and August.

- Fig. 9. The shell becomes relatively broader from side to side, its older parts being raised dorsally and laterally to form the umbos.
- Fig. 10. The left umbo (lu) becomes much more prominent than the right (ru), producing an asymmetry of the larva. Between them lies the hinge-line.
- Fig. 11. The tip of the foot (f), a creeping organ not hitherto known, protruding between the two valves of the shell.
- Fig. 12. A full-grown larva with swimming organ (velum) and creeping organ (foot) partly protruding. A





heel-like process of the latter bears the opening of the byssus gland which secretes the cement that fixes the larva to a rock or shell.

Figs. 1-12 are drawn to the same scale. Magnification 150 diameters.

## Figure 13.—Spat, Post-larval or Fixed Stages

There are six stages represented, drawn superposed, so as to indicate the mode of growth of the shell. The smallest (darkest) is the same as Fig. 12 reduced to one-third its dimensions (i.e. magnified 50 diameters). It is the youngest stage of the spat (just attached) and is about ·37 mm. (or inch) in length. Under normal conditions this youngest spat will be about one month old (from time of spawning) and should make its appearance about the second week of August.

The next stage shows a growth of new spat shell (ss1) around the lower margins of the larval shell (ls), and similarly with the following stages. The new matter added is secreted from glands in the thickened border of the mantle, and that of the lower or left valve increases the surface and security of the attachment. The figures  $\cdot 37$ ,  $\cdot 50$ ,  $\cdot 75$ ,  $1 \cdot 00$ , 1.50, 2.00 show increasing sizes of spats or stages in the growth of a single spat up to 2 mm. (or 1/2 inch) in length. By the time the spat is as large as a thumb nail the larval shell at the tip of its umbo is relatively insignificant. As growth proceeds there is the greatest addition below and behind, so that the umbos are carried farther forward. Spat of one inch length begin to be sexually mature, the males producing sperm. This is perhaps about the size at which the fishermen would recognize them as oyster spat and collect and transplant them. This would be in the second summer of their life and they should not be marketed as food before they are four or five years old.

(For a more extensive account see papers in the *American Naturalist* for January, 1905, January, 1909, June, 1910, and January, 1912. An enlarged complete work is in preparation.)

#### DISCUSSION: CONSERVATION OF THE OYSTER

Oyster Spat Dr. Jones: Would you tell us just what spat is?

Dr. Stafford: The first stage in the development of the oyster is the egg. The egg measures about one five-hundredths of an inch in diameter. What we may call the second stage is where the egg is divided up into a number of parts or cells. They multiply from the single egg-cell with a single boundary.

This does not take place all at once; first, there is a division into three parts, then a division of these again, and that process continues until there is a great number.

Another stage occurs somewhat like this: When the cell division has taken place and the whole mass is divided into a number of little cells, these cells begin to arrange themselves to make up the organs of the animal, and this will lead to the first free-swimming stage. This (indicating) is the mouth, this the stomach, this the intestine, and this the swimming organ. As soon as the organism commences to swim, we call it a larva. It begins to form a shell and the shell becomes bigger and bigger until it is large enough to enclose the whole animal. Then the animal undergoes a change in shape and comes to be something like this (indicating); instead of having a little straight hinge to its shell, it has what is called an umbo. The swimming organ, the velum, is still present, and at this stage the larva has a foot.

When the larva reaches its oldest stage, it ceases to swim around in the water, sinks to the bottom and fastens itself to the first solid thing to which it can get attached. Then, it begins to build a new shell and this is the first beginning of the adult oyster shell. In that stage it is called a spat. It is a larva up to the point which I have described and after that it is a spat. We call them spat as long as they are very small oysters.

DR. Jones: It is necessary that they should find something solid to attach themselves to at that stage?

Dr. Stafford: That is the all-important thing.

MR. Cowie: There is quite an important difference

between the terms "egg" and "spat"?

DR. STAFFORD: Yes. In the older literature on the subject you will find the word "egg" used to designate any stage. In most of the literature of the present time written by good zoologists, you will find the terms "egg" and "embryo" applied to very different things. It is well to have definite terms to describe separate and distinct stages.

Dr. Jones: About what time would it take to evolve

from one stage to another?

DR. STAFFORD: It takes five hours in an ordinary warm temperature to go from this stage to this (indicating on the sketch).

Dr. Jones: That is from the egg to the larva?

Dr. Stafford: Yes. The larva begins to swim in about five hours if development is taking place in July.

Mr. Cowie: How long does it take what was originally the egg to fasten itself at the bottom?

DR. STAFFORD: From three weeks to a month, depending on the temperature. May I be permitted to say that that is my own discovery? It has been usually held in England, France, Germany, Holland, the United States and wherever the oyster has been studied, that the oyster settles down within a few hours after it reaches the free swimming stage. Professor Brooks, of Johns Hopkins University, who first discovered that our American oysters

are of two kinds, males and females, traced them to this stage; but he did not trace their development afterwards, and it was generally believed that they settled down and became spat within a few hours or within a couple of days at most. This is not correct. You could not imagine an animal of that size (indicating) becoming an animal of this size (indicating) within a few hours. From that size to this size (indicating) they increase in volume a hundred and twenty-five times. Growth cannot take place rapidly. The animal grows by eating, and by developing its organs, and it has to take its time the same as the rest of us. We all begin at very small beginnings and it takes a long time before we come to the position of manhood.

Mr. Patton: Is this method of determining the exact time when the larva will deposit itself as spat feasible for the ordinary oyster fisherman, or does it need a trained biologist to apply it?

DR. STAFFORD: The trained biologist could give the fisherman of ordinary intelligence information and show him, so that he could apply it practically, but the fishermen with their present knowledge could not do it.

MR. WHITE: How are the oysters on the West coast doing?

Atlantic Oysters in the Pacific Prince Edward Island oysters were put out at various places in the gulf of Georgia. Some of the places were selected by Captain Kemp, the oyster expert of the Department of Marine and Fisheries. The oysters had to be kept for several days on wharves about Prince Edward Island before they could all be got together and shipped. As a result of that they were so long out of the water, that it became necessary to put them into the water on the Pacific coast as soon as possible. Consequently, Captain Kemp had not time to go around many of the localities at which people in British Columbia wanted

oysters planted, and they wanted them planted at a large number of places. He selected a few places and three of these places I was able to reach last summer from the place where I was working. Although there had been no information given to the Department as to just where these oysters were planted, I was able to hunt them up, and I found that some of them were living. Some of them had been placed a little too high above low-water mark and they were exposed to weather, sun and frost at low tides. This had carried off a great number. At one place I found only one living specimen that had survived of the two barrels that had been planted there. Nobody around there knew exactly where they were planted and so I was hampered in getting information. I had to spend several days before I could find some of them.

Nobody there, not even the fishery officers, knew that these oysters were breeding. One or two men knew that there were some specimens still living, but they did not know that they were propagating; in fact, everybody declared that they would never breed in Pacific waters. This was the most important thing I was able to discover with regard to them,—the proof that they are breeding. Finding that the eggs were ripe, I not only got specimens before they had deposited their eggs, but I found specimens in the water that had developed a little from the youngest larva stage. Not only were they capable of developing their eggs and spawning, but the spawn was developing into free-swimming larvæ, and I presume they were capable of developing further. When I left the Coast they were only in this stage, but from what I saw I am pretty sure that they can go through the whole process.

Mr. Cowie: Did you see any that had reached a state of maturity?

Dr. Stafford: Yes, some that had been transplanted. Some of them had the Prince Edward Island red sandstone attached to them.

MR. Cowie: Will those eastern transplanted oysters grow in the Pacific to the same size as they would if left in eastern waters?

DR. STAFFORD: I think so. Those that I examined were transplanted in 1905, and it was last summer that I was there. I do not think they grow quite as fast as they do in their own home. That is to be looked for, however. Oysters are rather tender in some respects, and if you disturb them, it takes them quite a while to get settled down again.

MR. Cowie: You think they would grow to as large a

size as the eastern oyster?

DR. STAFFORD: Yes, I am sure they would. I found specimens five inches long. I was able to judge from the marks on their shells how much they had grown, and I found they had grown pretty nearly a half larger than their size when transplanted.

Mr. Cowie: Would there be a possibility of cross-breeding between the Atlantic and the Pacific oysters?

Dr. Stafford: No, and for this reason: No Inter-The British Columbia oyster is a little thing, growing to a length of about two inches at the most. Our oysters, the Curtain Island oysters at any rate, which are in rather deep water in Malpeque bay, will grow to fifteen inches in length. That is exceptional; but it is not exceptional to find oysters seven and eight inches in length well developed. Those that grow to a length of fifteen inches are long ones that grow in muddy places where there is an effort on the part of the oyster to keep the open part of its shell above the mud. The British Columbia oyster is like the English oyster: every individual is both male and female; it is an hermaphrodite, but it is not male and female at the same time. The male genital organs develop early in the season, while the female genital organs do not develop until later, and therefore the animal does not possess this double characteristic at the same time. Our oysters in the East are either male or female and one cannot develop young without the aid of the other. On that account our Atlantic and Pacific oysters can never inter-breed.

The British Columbia oyster during development remains between the shells of its mother before it is thrown out. Our oysters give off their eggs unfertilized, and fertilization takes place in sea water outside of the oyster. Our oyster develops in the sea absolutely free from the mother, while the British Columbia oyster develops in the shell and under the protection of its mother before it is thrown out. The Atlantic and Pacific oysters are distinct species and they cannot inter-breed.

On the other hand, a great many people think that our Atlantic oysters do not belong to one species. That was stated by Lamarck, the great French zoologist a long time ago, and a great many have followed his views. However, modern investigators, who have paid attention to the subject, believe that there is only one species extending from Chaleur bay to the gulf of Mexico. The differences are not differences of species but of variety, due to differences between the places in which the oysters are living. Take the variety that is the most distinct from the ordinary oyster—the Caraquet. It is much larger than the Malpeque and has a curved, hard stony shell. I have taken Caraquet and Malpeque oysters, taken the eggs from the Malpeque, taken the sperm from the Caraquet, mixed them up in sea water in a tumbler and in five hours I have had millions of oyster larvæ swimming around in the tumbler. If there is any proof whatever of difference of species, it is the proof that two specimens cannot breed together. Here we have our two most distinct varieties breeding together. That is sufficient proof to show that they are only varieties and not species. I tried the same experiment with our transplanted Prince Edward Island oyster and the little British Columbia oyster, and the experiment failed, as one would

expect it would.

Dr. Jones: I have been told that in British Columbia the transplanted Atlantic oysters would develop into perfect specimens themselves, but they would not reproduce themselves.

DR. STAFFORD: That is what everybody out there says. I told the captain of a fisheries protection boat there, for example, that it was possible for them to reproduce, and he was very much surprised to learn it. He said that everybody believed that while they could live, they would not be able to reproduce themselves.

Dr. Jones: You were not able to find any beyond

the first larval stage?

DR. STAFFORD: No. I regard that as showing that the Prince Edward Island oyster will not only live, but will reproduce, in British Columbia waters. I regard it as a very important fact because it not only shows that Atlantic oysters will breed in Pacific waters, but it shows that if you transplant Atlantic oysters up and down the Atlantic coast to places where oysters do not at present exist, they will reproduce themselves.

Mr. Found: You mean United States oysters?

DR. STAFFORD: I would not transplant United States

MR. FOUND: What would be the effect if you did?

DR. STAFFORD: United States oysters will Canadian Cysters live in our waters provided they are not carried to cold places; but our oysters are better than the United States oysters. The best oysters in the United States are found around Cape Cod. The blue points, that were famous at one time, are over-estimated. Cape Cod is the most northerly point in the United States where United States oysters begin. Formerly they extended up the coast of Maine to New Brunswick; but there are none living there now, excepting, possibly, a few specimens in one or two places.

I would not attempt to transplant United States ovsters to Canadian territory. I think it is better to keep our Canadian oyster and encourage its development. Still, I have no doubt that United States oysters would in time, come to be developed so that they would have the same flavour as our Canadian oysters. My reason for saying that Canadian ovsters are of better flavour than United States oysters is not based altogether on their reputation in the United States and Canada. Our Canadian oysters took first place at the International Exposition at Paris some years ago. They had to be collected from various places in the Maritime Provinces and during that time they were standing in barrels on wharves, sometimes in the hot sun. After having been subjected to that treatment they had to be transported across the Atlantic and placed on wharves there until the exhibit could be arranged and yet, when placed in competition with European oysters that had been taken from the water only the day before, they were awarded first place. So, there must be something in their ability to withstand rough usage and change of climate. Oysters, as well as fish that are taken out of cold waters, can stand transhipment and retain their flavour better than those taken out of warm waters. That is the chief reason for my strong belief in our own oyster in that respect.

Mr. Found: Could not oysters produced along the coast of the United States, where seed oysters two or three years old could be obtained, be readily used for building up private beds and areas which had not produced any oysters? If so, would not the effect of leaving these oysters there a certain length of time be that they would tend to take to themselves the characteristics of our own

oysters, being of the same species and being subjected to the same conditions?

DR. STAFFORD: I think that what you say is correct.

MR. FOUND: I was extremely interested in what Dr. Stafford said in connection with the breeding of our oysters on the Pacific coast. This is the first time that the information has come to me. It has been stated in departmental records that they did not breed there. Are the beds where the spatting is taking place such as would enable the spat to set?

DR. STAFFORD: Yes.

MR. FOUND: You did not find any small oysters, one or two years old, growing there?

DR. STAFFORD: I left on the 8th of August, which is too soon to find spat.

MR. FOUND: Do you consider that this was the first year that they had bred?

DR. STAFFORD: I have no data upon that point; I do not know.

MR. FOUND: I would not think it was the first.

DR. STAFFORD: The beds where the Prince Edward Island oysters were transplanted are situated where there are millions of British Columbia oysters. Up to the size of the British Columbia oyster, it would be rather difficult to distinguish the two. They are too near alike to be sure in making a statement like that. There might be young spat there, but I could not distinguish it.

Dr. Jones: Is anything being done in Canada in the way of putting out cultch to which the spat may attach themselves?

DR. STAFFORD: Very little. In Richmond bay there is one man who has done a little even since before Confederation. He sold out, the property has changed hands two or three times and there is some cultch planting being done yet, but very little. There is a man named Sharpe

who bought the property belonging to the Richards family, and he is doing more of it. The last time I was at Malpeque I interviewed him and he showed me some specimens that he had transplanted from the eastern coast of the United States,—Connecticut, or some place in that vicinity,—to Malpeque. I could distinguish the American oyster from the Canadian oyster, but I would not say that I could do that in the case of very young spat which had been transferred to Canadian territory.

MR. FOUND: Dr. Stafford may, or may not be, unaware that the Department of Marine and Fisheries two years ago cleared an area in Richmond bay near Bird island. Are you aware of that?

DR. STAFFORD: I have not heard particularly about it.

MR. FOUND: Under the modus vivendi entered into with the different Provinces, we were permitted to issue leases to those who were prepared to undertake culture and cultivation of oysters on areas that were not then producing. For purposes of demonstration, an area was selected in Richmond bay near Bird island which has never produced. It was cleaned and planted with seed oysters which were collected from the bars of Richmond bay under conditions with which you are no doubt familiar. Last year another bed was formed near the county of Pictou, just off Caribou island. This area is also one which has never produced oysters. It has been stocked partially with oysters from Richmond bay. At the time, it was impossible to get a sufficient number of seed oysters to complete the stocking of it and Dr. Stafford's remarks impel me to explain that we have this year taken from the United States about two hundred barrels of seed oysters which we have planted on the remaining portion of the area there, with the view of determining just what will be the outcome from a commercial standpoint of bringing seed oysters, which can be cheaply procured to the south, to our waters, letting them

grow there and subsequently utilizing them as a source of supply for our Canadian markets. The whole object of these two experiments was to lead the way in the culture and cultivation of oysters.

Dr. Jones: Dr. Stafford, in his address, has referred to the necessity for some demonstration of oyster culture. I understand that that is really being done?

MR. FOUND: That is being done at the present time. DR. STAFFORD: That is one thing to be done, but there are a great many other things.

Mr. Found: It was a little experiment for the purpose of leading the way.

Dr. Jones: You think that more might be done by way of demonstration?

Dr. Stafford: Yes.

Dr. Jones: That is one thing that we have not taken up and if we could be of any assistance to the Department in taking further steps along that line, I am sure that we would be prepared to do anything we could.

Dr. Murray: I would like to ask Dr. Stafford whether the cultch becomes useless after being in the water a certain time. I understand that it needs to be taken up, cleaned off and a fresh supply put down.

Dr. Stafford: It would be better. It does not become altogether useless, but it very largely loses its efficiency.

Mr. Patton: I understood Dr. Stafford previously to refer to the need of a biologist to demonstrate to the fishermen just how they may find out when the larvæ are ready to attach themselves to the cultch, as well as to demonstrate the feasibility of oyster culture in a general way?

Dr. Stafford: Our oyster fishermen could not make use of the method which I have described. It is too technical for them at the present time; but those who are going into the breeding of oysters could be taught how to make use of it.

Mr. Found: You are publishing a paper in the Biological Report now being printed on that very subject?

Dr. Stafford: No; but there is a paper on "The Recognition of Bivalve Larvæ in Plankton." I have at present on hand a large work on the oyster which is a reprint describing in a more systematic way work that I have done upon this subject. It is approaching completeness. I have over five hundred pages and I do not know how much further it will extend. It will be illustrated to show the structure of the different stages in the development of the oyster and it goes minutely into the different physical conditions, the temperature of the water and all such matters connected with the life of the oyster in all its stages from the egg up to the adult.

MR. WHITE: While the experiments on the Pacific coast have shown that the Atlantic oyster can be transplanted, yet the results are not otherwise of value unless something more is done?

Dr. Stafford: The results are of no value commercially or economically unless a large quantity of Atlantic oysters is shipped and transplanted under the direction of one who knows what kind of places to put them into. There is no use in shipping eastern oysters out there and throwing them out on the mud where they will sink, or leaving them exposed to picnickers, Indians and others, or to the sun and the frost.

Dr. Jones: I shall now ask Mr. Found to give us his paper on "The Lobster Fishery of Canada."

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# The Lobster Fishery of Canada

By W. A. FOUND

Superintendent of Fisheries for Canada

R. Chairman and Gentlemen,—I am sorry indeed that, owing to conditions which were entirely unforeseen, I was unable to have the benefit of the remarks which have gone before. I am also not without some regret that I agreed to speak to you on this subject, because extreme pressure of work has made it quite impossible for me to do what I should like to have done in courtesy to you and in justice to the subject—that is, prepare a paper. I have merely been able to make some notes and, labouring, as I do, under the disadvantages of a lack of preparation, I can only express the hope that I may not leave out some of the statements that I might be most desirous of making to the Committee. However, I trust that my remarks may be followed by a helpful discussion. The Department is extremely anxious to have any suggestions which may arise from a consideration of such an important subject as this.

The lobster fishery in Canada was of no importance until the time of the introduction of canning. Canning was introduced into Canada from the Northern United States, apparently in the latter part of the sixties. Even at that early date the lobster fishery in the coastal waters of the Northern States was in a seriously depleted condition owing to the intensive fishing that had been carried on, and those who were engaged in it saw in the Canadian fishery a magnificent opportunity of continuing their industry. At that time lobsters were very abundant all along the five thousand miles of Canadian coast line from Passamaquoddy bay to Labrador. In fact, they were found inshore much earlier in the season than they are now, no doubt being driven there for food.

It was not an uncommon thing after a heavy storm to find windrows of lobsters stranded on the coast. These were merely carted away by the farmers for fertilizer. It is not surprising, under these conditions, that when a method became known whereby these lobsters could be made available for human consumption, could be put up in such a way that even upon remote sections of the coast they could be turned into a desirable marketable article, the method spread with great rapidity. In 1869 when canning was nicely started in Canada there were 61,000 one-pound cans put up. The very next year the quantity increased to half a million, and in 1871 it went up to over the million mark. Ten years later it reached its zenith with a pack of over 17,000,000 pounds. From that time on there were the usual ups and downs in the catch, owing to weather conditions generally; but the trend was downwards until about 1898, when the production was somewhere about the 10,000,000 pound mark, or, between 10,000,000 and 11,000,000 pounds. For about ten years it was stationary, and arguments began to be forthcoming that the time had come when the lobster fishery had reached a state of equilibrium, that it would not increase or decrease any more, but that natural reproduction would keep up the supply.

Of course, those who were using these arguments were entirely forgetful of the fact that increased efforts were being made every year to keep up the catch. More and improved traps were being used than in former times, and consequently more lobsters were being captured. In the early days the fishermen used a trap which had an opening at each end and in which bait was hung in the middle. When the trap was pulled, one end would tilt downward and some lobsters might escape. Now, a trap such as the Wheeler, Diamond, Parlor or Jail trap, is in common use. As these are pro-

vided with more entrances, it is much easier for the lobsters to get in and very much more difficult for them to get out. The end that is below when these traps are being raised is a blind one, so that any lobsters that drop down cannot fall out. There thus came to be not only a decrease in the aggregate catch, but the size of the lobsters caught was materially decreased; and this is always one of the first signs of the decadence of a fishery. In 1909 there came another decrease in the pack. In that year the quantity fell to the 9,000,000 pound mark, and it still hovers around

that figure.

I have not yet dealt with the shipping of Trade in Live Lobsters live lobsters to the markets of Canada and the United States, another industry connected with the lobster fishing, that sprang up in the early eighties. I have not done so, since the growth or decline of that industry will not give an indication of what the condition of the fishery is all along the coast, because, owing to geographical conditions, the live lobster fishery is largely confined to that portion of the coast west of Halifax. The catch to supply the live lobster trade amounts yearly to between 100,000 and 120,000 cwts., all of which are shipped as they are taken from the sea. The trade is considerably less than in former years; but I do not wish to place too much emphasis on the statistics in so far as the live lobster trade is concerned in the earlier years, because I am not entirely satisfied that they are perfectly reliable. I am afraid that, owing to the lobsters passing through several counties en route to their destination, they might, in some instances, have been entered twice in the returns. That would not be the case so far as the canning industry is concerned, as, under the Fisheries Act, each cannery is compelled to furnish the Department with a statement of the quantity of lobsters packed by it each year. So, we may take the figures in so far as the canned lobsters are concerned, as being absolutely correct, or very nearly so.

This brings me to a consideration of the Lobster Fishery present state of the lobster fishery. While, from what I have already said, it may be inferred that there is a very serious decadence in the fishery, I do not wish it to be understood that the Canadian lobster fishery is a depleted one. It is, and always has been, the most extraordinary and the most productive lobster fishery in the world. At the present time, there are possibly more than 50,000,000 lobsters canned or taken from the coastal waters of Eastern Canada each year. The value of the industry is considerably over \$3,000,000, the figures for 1910 being \$3,780,000. It ranks second only to the great cod fishery. There are nearly seven hundred canneries valued at over half a million dollars, while the traps number over one and a half million and are worth over a dollar each. So that, to say nothing of the boats, which are used for other fisheries as well, the plant has a value of over \$2,000,-000. Eleven thousand men are engaged in the actual fishing operations and over eight thousand people find employment in the lobster canneries, over half of these latter being females.

Restrictive Regulations tion of the lobster fisheries. When the fishery was first exploited, lobsters were found in such extraordinary abundance that people never dreamed that the day would come when any protection would be required; but in view of the very rapid development of the fishery, which I have outlined, the Department was soon driven to the conclusion that, if something were not done, the fishery would be seriously over-done. As early as 1873 the first regulations were adopted. These merely prohibited the taking of soft-shell lobsters and of berried lobsters, that is lobsters which have their eggs extruded and carried on the outside of the body. A weight limit of one and a half pounds, equivalent to prohibiting the capture of about a 10-inch

lobster, was fixed. It was found that the weight limit was impracticable, and the next year a size limit was adopted. A close season was also provided during the months of July and August.

From time to time every few years changes Lobster-Fishery were made in the lobster fishery regulations and the conditions were made more restrictive until 1898, when a commission was appointed to investigate thoroughly the condition of the fishery and the requirements of the industry. That commission, of which Professor Prince was chairman, went carefully into the matter, taking evidence all around the coasts of the Maritime Provinces. It brought in a valuable report, as a result of which new regulations were adopted in 1899. Under these regulations the Maritime Provinces were divided geographically into six districts. It was recognized, as it had been previously to a certain extent, that, owing to the variation of climatic conditions in different districts, different seasons during which the lobster might be taken should be fixed. The outstanding features of these regulations,—indeed, the outstanding features of practically all the regulations were:

First, a close season;

Second, a size limit; and

Third, the protection of the berried lobster.

The desirability of the first and third of these is so obvious that it scarcely need be dwelt upon; but the efficacy of a minimum size limit appears doubtful for various reasons. However, I shall refer to that later.

The size limits provided by the regulations of 1899 were ten and a half inches on the bay of Fundy, nine inches on the Atlantic coast as far east as Halifax, and eight inches on the remainder of the coast. A determined effort was evidently made at first to enforce these size limits; but it soon became obvious that if such

were done it would force the canneries on practically all portions of the coast to close down. The size limit consequently became a dead letter, notwithstanding that it remained a condition of the regulations,—a state of affairs which, I need scarcely say, was most undesirable.

Realizing the urgent necessity for workable regulations that would afford the fishery adequate protection, the then Minister of Marine and Fisheries, in 1908, had under consideration the appointing of another commission, to investigate exhaustively the condition and requirements of the industry; but in that year a Select Standing Committee of the House of Commons on Marine and Fisheries was appointed, and as it had all the facilities to enable it to procure the necessary information, the whole question of the best regulations and policy to govern the conduct of the lobster fishery was submitted to it. This committee devoted practically the whole of its time during two sessions of Parliament to a consideration of the matter, and had the advantage of having a special commissioner appointed to go round the whole coast during the recess and take evidence from those interested in the industry. In accordance with the recommendations of this committee, the regulations were amended in 1910, the changes being the abolition of the size limit, except in the counties of Charlotte and St. John, N.B., where there are no canneries, and the substitution for it of a standard trap, having spaces between the lathes of one and a quarter inches and three-inch mesh netting in the heads. Existing traps were to be allowed to be used until the end of the present season, but all new traps built after the year 1910 were to be in accordance with the above requirements.

Hon. Mr. Sifton: What is going to be the effect of relaxing your regulation in regard to size?

Mr. Found: I shall come to that in a moment in dealing with the natural history of the lobster.

In the protection of the lobster, the great Canneries problem is the lobster cannery. Under existing conditions, the only method by which lobsters can be prepared for market on most portions of the coast, owing to the remoteness from the larger centres of consumption, is by canning. After they are canned, inspection of the lobsters to see whether the regulations are complied with, is impracticable. Again, were it not for canning, the enforcement of the close season would be a simple matter. With an ever-increasing demand, canners will naturally make every endeavour to put up as large a pack as possible during the limited time at their disposal, and this notwithstanding advancing prices. Then again, the fishermen as a usual thing, sell their catches to the canners by weight. Hauling traps is hard work, and with lobsters not plentiful, it will be appreciated that the fisherman will reluctantly throw overboard any he may find in his traps, no matter what their size or condition. Should one canner demur at taking those not in accordance with requirements, the fisherman will usually be able to point to another who will, and so require the conscientious canner to take all or none. Should the canners refuse to take berried lobsters, it is readily possible for the fishermen to scrub off the eggs before bringing the lobsters ashore, and thus place them beyond the ban of the law.

When lobsters are shipped in the shell, it is comparatively easy to enforce compliance with the regulations, as they can be readily inspected. The demand of the market is also a strong controlling factor.

Hon. Mr. Sifton: How many canneries are there? Mr. Found: About six hundred and eighty.

From Halifax west the live-lobster trade is largely engaged in, the small lobsters—that is those under nine inches—that may be taken being sent to the canneries. Though the lobster fishing season there is long—about

six months—it is mainly confined to the winter, when the weather conditions prevent very intensive fishing being carried on. Otherwise, the fishery there would doubtless before this have been in a very much more serious condition than it is.

I believe the day is coming when the live-The Boiledlobster trade and even the canning of lobsters Lobster Trade will be practically replaced by the boiled-in-the-shell trade. I make this statement with a good deal of diffidence. because I know the practical men in the business do not agree with me. At the present time the demand in hotels and restaurants is for broiled lobsters. To meet this demand, uncooked lobsters are necessary; but it does seem to me that a lobster that is boiled as soon as taken ashore, then washed and wrapped in wax or other suitable paper, and placed in cold storage, and transported in such, is a better and more attractive article of food a week or fortnight hence, than one that has been slowly dying from starvation or other causes during at least a portion of that time.

Hon. Mr. Sifton: How long can they be kept alive? Mr. Found: Lobsters can be kept alive if their gills are kept moist—

Hon. Mr. Sifton: Do you have to keep them in salt

water?

Mr. Found: No. If they have moist seaweed or the like about them, they need not be kept in water, though, of course, they are retained in crates in the water right up to the time of shipping.

There is another point on which I should Berried Lobsters like to lay strong emphasis, viz.,—the need of protection of berried lobsters. The presence of hatcheries on some portions of the coast and not on others, adds to the difficulty of doing this. A lobster hatchery at a given place can be available only to the fishermen operating within a reasonable distance of it. These fishermen are

allowed to retain all the berried lobsters they may take, in order that the eggs therefrom may be taken to the hatchery. After the eggs are removed the lobster finds her way to the cannery. A fisherman operating just beyond the district of the cannery is required by law to liberate all berried lobsters he may find in his traps; but the fact that his neighbour may legally retain such, obviously increases his temptation to scrub the berries off, and so make it practically impossible for even an energetic fishery officer to prove him guilty of a violation of the law.

Keeping in view this fact, and the further one that no hatchery is equal to the mother lobster herself, who will hatch out every hatchable egg, and that under natural conditions. I am not without doubt as to the value of lobster hatcheries. I am aware that the fry are distributed from the present-day hatchery about as soon as hatched, nevertheless, I am of the opinion that if there were no hatcheries at all, so that the fishermen on all parts of the coast would be on an even footing, it would be possible, by an educational campaign, to induce them, in their own permanent interests, to liberate all berried lobsters they might take. Of course, hatcheries are popular with the fishermen, and for obvious reasons. They assure them of a market for lobsters that it would otherwise be illegal to capture, and they make it certain that the eggs from such lobsters will be hatched and the fry returned to the ocean.

Few lobsters under eight inches in length yield eggs, and the majority of lobsters are about this size before attaining maturity. A lobster eight inches long will yield 5,000 eggs on an average. It is estimated by scientists that when young lobsters are hatched in the natural way in the sea, not more than one in from 10,000 to 15,000 comes to maturity. If all breeding lobsters were of this size, it would mean that the hatch of two or three would be required to produce another mature lobster; so that,

even without fishing, the natural increase would not be equal to the decrease, and the fishery would become extinct. The egg-producing power increases with great rapidity with the size of the lobster. With every two inches of growth in length the number of eggs produced by the female lobster is doubled until the lobster reaches a length of about sixteen inches; thereafter the increase in productive power is not so great. While the eight-inch lobster will produce about 5,000 eggs, the sixteen-inch lobster will produce 80,000, so that the sixteen-inch lobster is equal in productive power to about sixteen eight-inch lobsters.

I would like to refer again to the size A Doublelimit regulation. This regulation had in view the protection of the lobster up to the time that it would become reproducing, and it stopped there. It overlooked the fact that if you protect lobsters above a given size, you will do very much more. Those who have been giving very close attention to the matter in recent years are being driven to the conclusion that a better regulation would be a double-size limit—one which would protect the smaller lobsters, which from the standpoint of cost of handling if from no other, should not be taken; and another which would protect the larger lobsters, which have not such delicate flesh and are not so desirable for market. A regulation which would protect a lobster which was under seven inches and over twelve, would possibly be more effective than the size limits which have been laid down in the past, on account of the reasons I have just outlined. Moreover, a regulation of this kind would probably be more easily enforceable by regulating the trap to be used. By requiring a given space between the laths of the trap, the smaller lobsters would have a chance to get out, and by limiting the size of the ring in the heads of the trap, those over a certain size could not enter.

Dr. Robertson: Is it known for how long a period the berried lobster is reproductive?

MR. FOUND: Lobsters at least nineteen inches in length have been found with eggs attached. A lobster of such a size would be quite old. A lobster eight inches long would possibly be five years old.

When lobsters are first hatched they ascend to the surface, swim about and are carried around by currents. They are consequently the prey of the fish swimming near the surface, and before becoming lobsterlings and taking up the habits of the adult lobster, they have to go through a process of moulting, shedding their tiny shells four times or more. The effect of this on the constitution of the lobster will be appreciated. Moreover, these moults usually take place in from three to four weeks, so that only the more vigorous survive. If the fry could be retained after they are hatched out, until they had reached the grounding stage, a long step towards assuring the preservation of the lobster would have been taken.

The state of Rhode Island has possibly Improved Hatchery led the world in the effort to find a practicable means of doing this, and it has been, to a considerable extent, successful. The method which has been adopted has been to reproduce as far as possible the natural conditions prevailing in the deep sea. Floating cars or boxes about ten feet square and four feet high, are used, in which there is arranged a kind of paddle, much like the overhead fans in restaurants. This is kept slowly revolving thus keeping the water gently agitated and preventing the lobsters from accumulating in one place. Lobsters are very cannibalistic in their tendencies and the necessity of keeping them from crowding and, also, of keeping them well fed, is obvious. The female lobsters are selected and placed in these boxes a short time before the eggs are going to hatch. The lobsters are left to hatch in the

usual way until a box contains as many fry as it can accommodate. The fry are very carefully fed. The result has been that they have succeeded in saving as high as about fifty per cent of the fry that were hatched out in the boxes, and they have done it, to a limited extent, at a cost of \$2 per thousand lobsterlings.

The method is scarcely a practicable one at the present time. It is expensive, it is very limited in its capacity, it can be used only in the most sheltered and favoured places; but if some quite practical means are found—as I have no doubt they will be—of retaining the fry and the lobsters until they reach that stage, we shall then have done much towards solving the question of keeping up the supply of lobsters. I have no doubt that the Canadian Biological Board will be able to give this matter very close consideration, and let me express the hope that they may be instrumental in placing before the world the means of doing what I have just outlined.

These are the outstanding points in connection with the lobster fishery. If there are any points I have omitted, upon which I can give the Committee any information, I shall be glad to do so. I hope that a useful discussion will follow and that some suggestions will be made which will be of value to the Department in dealing with the matter.

## DISCUSSION: THE CANADIAN LOBSTER FISHERY

Hon. Mr. Sifton: I want to ask categorically what should be the regulation in regard to the size limit?

Mr. Found: I think that a size limit is an absolutely impracticable regulation where the industry is confined to canning. If you have a size limit, you must make it so small that it would not protect any lobsters for which it would be worth while having a size limit.

HON. MR. SIFTON: Leaving out of sight the question of the effect on lobster canneries, what is likely to be the result of not enforcing the size limit?

Mr. Found: My own opinion is that the size limits that have obtained in the past have not accomplished much for the industry.

Hon. Mr. Sifton: Perhaps the regulation was not enforced?

Mr. Found: In my opinion it did not accomplish much, even to the extent to which it was enforced, because the lobsters that were saved were so small that the number of eggs produced by them was of little value.

HON. MR. SIFTON: Suppose matters go on as they are now, what will be the effect on the lobster industry?

Mr. Found: I am very much afraid that if more restrictive regulations are not enforced, we can expect nothing but a continued decline in the fishery.

Hon. Mr. Sifton: Do you look for a rapid decline in the near future?

Mr. Found: The decline is likely to be more rapid in the future than it has been in the past. It must be the case, as it was in the oyster fishery, because, as the number of producing lobsters becomes less, the sea is receiving a lesser number of fry each year, and with the extraordinary efforts that are being made to catch as many lobsters as possible, the candle is being burned at both ends.

The Committee took recess until 2.30 p.m.

### Tuesday Afternoon's Session

The Committee resumed at 2.30 p.m.

Dr. Jones: The order before the Committee is a continuation of the discussion of Mr. Found's address on the lobster fishery. Has any gentleman any remarks to offer or any questions to ask?

DR. ROBERTSON: If it would not trespass upon Mr. Found's time or the time of the Committee, I would like, for my own sake, and perhaps for the sake of others, a very brief statement as to the practice that is followed in a lobster hatchery—how long the young are taken care of, how they are taken care of and how they are disposed of. I do not know what methods are pursued in this work.

MR. FOUND: The practice that is being followed is to have collecting boats go out from the different hatcheries and visit the various canneries that are within reachable distance. The canneries are supplied with crates in which berried lobsters are placed when they are taken there. A spawn-taker from the hatchery accompanies the boat, to remove the eggs from the berried lobsters. These eggs are then taken to the hatchery, placed in the jars, and left there until they hatch. As soon as possible after hatching, they are placed in sea water in barrels or other suitable receptacles, and taken out to sea where they are distributed over the areas in which conditions obtain approximating these which would attend the hatching of the lobsters in the natural way.

DR. ROBERTSON: How long a period elapses between the first stage of hatching and the time when the lobsters are distributed.

MR. FOUND: That would depend on the temperature of the water. I should judge that it would be in the vicinity of between three and four weeks at the first of the season. It might be a little longer farther north where the water is colder.

DR. ROBERTSON: If the lobster could be protected when young, would it not multiply its chances of surviving several hundred times?

MR. FOUND: Several thousand times.

Dr. Robertson: Why go to the expense of hatching at all unless you can afford better protection in the early stages of the lobster's existence?

Mr. Found: You are touching a question there which is one that requires careful consideration. The strong argument in favour of hatching is, that if you do not provide a means of caring for these eggs, many will be lost. Lobster fishermen can make a berried lobster legal by merely washing the eggs off, and they are liable to yield to the temptation. If the fisherman washes the berries off instead of returning the lobster to the water, the eggs will go to the bottom and die. The argument is that there is a saving to that extent. I am not sure that, if there were no lobster hatcheries at all, it would not be possible to work up a sentiment amongst the fishermen by an educational campaign which would be sufficient to induce them to release all berried lobsters that they might take.

Dr. Robertson: Could you give us now, or at some other time, an estimate of the probable cost of taking care of the young lobster?

MR. Found: It is not a matter of cost at all; it is a matter of discovering some practicable method of doing it. The experiments conducted under the direction of the state of Rhode Island has accomplished more than the experiments of any other experimental station in the world; but it is not held, even by the Rhode Island authorities, as I understand it, that they have found a means which is sufficiently workable to be put into common use. Very large expense would be justified in discovering such a method. The retention of the fry until large numbers of them reach the grounding stage would be a most important matter. For instance, I remarked a little while ago, that one in 10,000 under natural conditions reaches maturity; if it could be made one in 100, you can see at once what an economic advantage it would be.

DR. ROBERTSON: Would it be at all feasible to screen, by some form of wire netting like a weir, instead of a thread netting, a certain area of sea water in a selected place, keep the young lobsters there and protect them against their enemies, the larger specimens of their own kind.

HON. MR. MATHIESON: They are terrible cannibals. I have seen yesterday's hatching of fry eaten to-day.

MR. FOUND: The stronger individuals in the hatching will prey upon the weaker, and to overcome this has been one object of the experiments that have been conducted. To do this they are kept apart and fed every two hours night and day.

Dr. Robertson: My idea is to have this wire netting keep the larger and the smaller ones separated.

MR. FOUND: Leaving their cannibalistic tendencies out of consideration, you would not have the required open-sea conditions and the death rate would likely be very great from causes which Dr. Stafford might be better able to explain than I. The lobster, after he is hatched under natural conditions, is out in the deep sea, and these conditions would need to be replaced in any successful hatchery.

Dr. Jones: How many hatcheries are there on the Atlantic coast?

MR. FOUND: Thirteen.

DR. JONES: These largely exist to collect the berried lobsters and strip them?

Mr. Found: Just to collect the eggs from the berried lobsters that come to the canneries.

Another point is that it is now generally accepted as being satisfactorily established that the lobster lays eggs but once in two years.

HON. MR. MATHIESON: That must be something entirely new. I never heard that suggested before.

MR. FOUND: That conclusion was first reached by some scientists in 1895. It was disputed; but at the present time I do not think that any person who has been engaged in actually experimenting with young lobsters and in the breeding of lobsters, holds any other opinion. Do you, Dr. Stafford?

Dr. Stafford: No.

MR. FOUND: I think it is a generally accepted fact at the present time. It has been established by actual experiment. Of course, there are exceptions to the rule. It has been established, however, by holding lobsters in pounds, and it has been established by transferring lobsters to the Antipodes, where they still produce their eggs but once in two years, although they changed their season of hatching.

Hon. Mr. Mathieson: I remember a great many years ago before any lobster hatcheries were talked about, that there was a firm, McDonald Bros. by name, fishing in Georgetown, and quite close to their factory was a stream discharging into the strait of Northumberland. As is the case with all streams that flow in there, a sand bar blocks the course to the sea and makes a pond at the mouth of the stream. That pond at high tide is overflowed with salt water. When the tide falls low it remains filled, and with the discharge of fresh water from the stream above. it overflows. This firm took the berried lobsters and put them right into this pond. The pond was perhaps only from five to seven acres in extent, and it had a maximum depth of about six feet. After a time the young hatched. In a freshet the sand bar was cut through and the young lobsters all went out to sea. But the hatching kept on and instructions were given from the Department of Marine and Fisheries to have these young lobsters liberated about three miles out. Last year on account of stormy weather, they could not manage it, and so they turned

them loose in the estuaries of the Montagu, Cardigan and Brudenell rivers. This year the fishermen report great numbers of small lobsters around the harbours. I think it would be well to follow that up, make enquiries and, if possible, verify it. The fishermen generally say that never since the old days, have they seen as many young lobsters around the shores when the tide goes out.

Mr. Found: That is a question that has been before the Department on many occasions. From inquiries that I have made of those who have been closely studying the life history of the lobster, I have been given to understand that such inshore areas are often more destructive to them than are such areas to ships. Of course, there may be exceptions, and areas with rocky bottoms are most desirable for the young lobsters. But all the conditions point to destruction of the fry by the multitude of fish inshore. I know that the question is one in regard to which there are very strong views held to the contrary. I also know that from some hatcheries—although not in this country—fry have been distributed upon inshore areas. You may have given that matter more attention than I have, Dr. Stafford.

Dr. Stafford: I have often been struck with the fact that in dredging out to 50 fathoms of depth I never bring up any young lobsters. While you get plenty of other kinds of crustacea you never get a young lobster. The same thing occurs in using the plankton net. While you get any number of small crustacea, you seldom get the young fry or swimming lobster.

Dr. Stafford: How far north are lobsters found?

MR. FOUND: Right up to Labrador.

Dr. Stafford: Where is the most northerly hatchery situated?

MR. FOUND: In Bonaventure county on the gulf of St. Lawrence.

DR. STAFFORD: I spent one summer at Seven Islands, where there is no commercial lobster fishing. The people there simply tie a big fish upon a fish pole and hook the lobsters out from the rocks. I was wondering whether the fishery there could not be made to pay?

Mr. Found: The bottom conditions are such as to make lobster fishing impracticable. The water is also

very deep.

DR. STAFFORD: I understand that one of the United States packing establishments sent an expedition up there one year to find out about it, and the Commissioner of Fisheries stated that it would not take them long to fish the lobsters out.

Mr. Found: I imagine that the lobsters are not very plentiful in those northern waters.

Hon. Mr. Mathieson: The cod fish is the great enemy of the lobster. Some years ago I saw six lobsters in the stomach of a large cod—that weighed about 70 pounds dressed. Two or three of these lobsters would probably measure six or seven inches in length. The cod fish come inshore now with the herring spawn and they are the greatest enemies that the lobsters have.

The general attitude towards the conservation problem in regard to fisheries is largely epitomized in the proposition that I remember hearing laid down by an old half-breed in the West. Great quantities of jackfish were being caught in lake Winnipeg and I said to him, "How long do you think this is going to keep up?"

He replied: "This will keep up always."
"How do you make that out?" I asked.

He said: "It works this way: if you catch the big jackfish, you save the little ones; and if you catch the little ones, it makes no difference, because the big ones will eat them anyway." There is a lot of that kind of logic being used now in discussing the depletion of our fisheries.

DR. STAFFORD: When you were speaking a moment ago about the fishermen's views it struck me that fishermen make a number of mistakes in regard to the lobster. They think that all animals they get in a shell and all kinds of shrimp-like animals are young lobsters. That is not so at all.

MR. FOUND: Would it not be unlikely that these would be young lobsters that were hatched, in view of the fact that fresh water is almost deadly to the lobster?

Hon. Mr. Mathieson: The lobsters go up into the estuaries of these rivers, and it is supposed they spawn in them. The tide ebbs and flows and the water is very salty. It is good oyster ground.

MR. FOUND: Oyster ground!-Yes.

Hon. Mr. Mathieson: I notice every fall, beginning in August, that traps are set for lobsters miles above the point where the young lobsters were set free. The lobsters come in and bed there and it is supposed to be their natural spawning ground. I quite understand that there are very many things fishermen do not know in regard to this matter and that one can only accept their statements in so far as they can be verified. This idea, however, is widespread around Georgetown; the fishermen are talking about it, and remarking that they have never before seen so many of these young animals which they call lobsters.

DR. STAFFORD: When Dr. Penhallow was working at the biological station at Harbour de Lute on Campobello island, he undertook the construction of a breeding pond, and I went down with him to look at the place. Some local men who were enthusiastic over the pond were also present. After we had been there a short time, the tide being low, we came across some crustacea which they thought were young lobsters. There was not a young lobster among them at all.

DR. MURRAY: You spoke of a proposal to allow the catching of lobsters of from seven to twelve inches in length, and prohibiting the fishermen from catching those above or below those sizes. What do you think the chances of the lobster would be for escaping the fishermen while it is growing from seven to twelve inches?

MR. FOUND: That is a question that can only be dealt with in a general way. There is no doubt that a certain number of lobsters will always remain uncaught. The larger that number is, the better; but if we can be absolutely sure of saving those that do escape beyond the twelve-inch limit, something will be accomplished. I am not fixing that limit as the most desirable one; it is merely one of the limits that have been suggested. If we were sure that all the lobsters that reach that size would be protected and that they would continue to be breeders, we would have gained that much.

DR. MURRAY: Don't you think that they would constitute a very small number?

MR. FOUND: It would be an ever-growing number. There would be a certain number always passing into that class. As none of them would be caught, there surely would be more passing into that class than would disappear on account of natural causes.

DR. MURRAY: I would be inclined to think that there would be a diminishing number reaching that size.

MR. FOUND: If that would be the case, how has the fishery been maintained to the extent it has been up to the present time?

DR. MURRAY: That is something we would like to have answered.

DR. ROBERTSON: Will a lobster, after it grows to twelve inches in length, be productive or retain its fecundity twenty-five or thirty years?

MR. FOUND: I would not like to state how long. Many lobsters of a very large size—say nineteen inches in length—have been found laden with eggs. A lobster of this size would be very old, as an eight-inch lobster is four or five years old. They bear eggs for many years.

Hon. Mr. Mathieson: The impression Illegal Fishing among the lobster packers of Prince Edward Island is, that if the regulations that have been in force for the last few years were strictly enforced, there would be no danger of the fishery ever being destroyed. There is an immense amount of illegal fishing carried on and it is destructive in every sense. The lobsters are inferior in quality, the packing is badly done because it is carried on clandestinely, and the prices realized are low. These lobsters come into competition with the regular stock and depress the price. All the dealers in lobsters are constantly afraid of the inroads that may be made on the market by the illegal catch. It is a difficult thing to enforce the fishery law, but I know that around Prince county illegal fishing has been enormous. One of the best packers in Prince Edward Island told me that he had refrained from illegal fishing until three years ago, and then he said that he saw it was going on to such an extent that it was not a fair game to allow the other fellows to fleece him as they were doing; so he broke the law and went into that kind of business too. That man is at the head of a large packing institution that controls a considerable number of factories. Men who have been in the business from the beginning will say the same thing: "Give us an absolutely close season and the lobster fishery will maintain itself without diminution."

Thirty odd years ago, when I was a boy, the lobster-packing business was in its infancy. The box trap had just been introduced. Before that fishing was done with the hook trap. These traps caught lobsters

large and small, but chiefly the large ones. Then the box trap came. When these had been in operation two or three years, the cry began to go up around the shores and among the packers that the lobsters were getting smaller and smaller. Twenty years ago the impression was formed in the minds of the packers that they were just at the close of the business. But the business did not close; the factories and traps multiplied, the men are operating four times as many traps as they did in the old days and they are catching more lobsters than ever before. The price now is dangerously high, about \$20 per case, that is about 40 cents a pound for the lobsters as packed. It is an enormous price and it constitutes a great temptation for men to break the law. That is one reason why it becomes necessary to exercise the greatest care in the protection of the fishery out of season. Then, again, these crustacea are easily captured. In the fall the lobsters come up to shoal water. At Georgetown you can drop the traps over the wharf and get lots of them. People get them practically at their own doors.

Dr. Jones: What is the close season?

HON. MR. MATHIESON: The close season begins the 1st of July and extends to the 26th of April. I have heard all the best fishermen discuss the matter over and over again, and the consensus of opinion is that with a rigid enforcement of the law and a rigidly enforced close season, the lobster fishery will not deteriorate.

Dr. Jones: The open season lasts only ten weeks?

Hon. Mr. Mathieson: Yes, and then several days are often stormy.

Mr. Found: From 77 to 92 days as a general thing.

Dr. Robertson: What is the sentiment of the men who own the canneries; are they in favour of the close season being maintained and enforced?

Hon. Mr. Mathieson: They would all like it.

Dr. Robertson: Well then, why isn't it done?

Hon. Mr. Mathieson: A number of men have been fishing with impunity, during the close season. They have been breaking the law, and, as I told you, they reason the same as did this man who controls a number of factories: "I kept the law right along until I saw there was no use; the other fellows were breaking it and so I broke it."

Mr. Found: I am afraid a wrong impression is being given the Committee. Unfortunately, there are some parts of the coast where the lobster fishing regulations are harder to enforce than others for reasons which it is difficult to understand, and there is no question that Prince Edward Island is one of these places. I could point to places where the fishermen will admit that there is scarcely a breach of the close season regulation; yet, on those portions of the coast where the season is being carefully maintained, there has been a decline in the fishery.

Hon. Mr. Mathieson: On which part of the coast?

Mr. Found: From Halifax eastward you will never hear of such a thing. On the other hand, I want it to be understood that the Department is entirely alive to the absolute necessity of enforcing the regulations. Five new patrol boats are being built during the present year, and we hope in a short time to be in a position adequately to control the situation on all parts of the coast by combined action between the patrol boats, which are at work on the sea, and shore officers, who work along the land. Neither one nor the other acting alone can accomplish the object.

HON. MR. MATHIESON: That is right; you have to work on both the land and the water. You have to root out the places where they are putting up the goods.

Dr. Jones: Do you confiscate the traps?

Mr. Found: Yes.

HON. MR. MATHIESON: That does no good because you are smashing up the traps that John Doe has been fishing with and you are not smashing up the traps of the man who has been doing the illegal fishing. I know of two days' work that was done by a patrol boat in smashing traps, in which they did not smash one single cent's worth of property belonging to the man who had done the illegal fishing.

MR. FOUND: Around Prince Edward Island over fifty per cent. of the lobsters taken are below eight inches in length.

DR. Jones: What is the present regulation in New

Brunswick regarding size?

MR. FOUND: There is no size limit except in the counties of Charlotte and St. John.

DR. JONES: Are there any trap regulations?

MR. FOUND: There is a trap regulation which goes into force after the present season. The head of the trap must have a three-inch mesh, and there must be an inch-and-a-quarter space between the laths. It was realized that if this regulation were immediately enforced, it would impose a great hardship on many packers who had their traps built differently. The Committee of the House of Commons recommended that all new traps built after that date should be constructed according to the new standard, and after the present year all traps must be built according to that standard.

DR. Jones: These traps will exclude large lobsters?

Mr. Found: They will allow small lobsters to escape, but there is no regulation as to the size of the ring.

Hon. Mr. Mathieson: The ring is made small. The result of that is that the big lobsters are excluded. This regulation provides for a space of one and a quarter inches between the laths. What the fishermen and canners say is this: "The ring that is adopted excludes the large ones,

and the space that is prescribed by law permits the escape of the small ones; the fishermen get nothing." I know of one factory where they used traps that were according to the regulations. These traps were not catching one-seventh of what the others were getting. If the rule requiring slats an inch and a quarter apart prevails, the fishermen say they might as well quit the business. The rule has been suspended for a year.

Mr. Found: Not suspended.

HON. MR. MATHIESON: The intention was to put it into operation.

Mr. Found: It is in operation now.

Hon. Mr. Mathieson: It was intended to have put it into operation the year before last.

Mr. Found: I might explain that a number of tests have been made at different points along the coast to ascertain the catching and holding power of different traps. Traps were set with spaces between the slats very small, others with slats an inch and a quarter apart. This test was not considered satisfactory in view of the fact that some of the traps might have been set at better places than others. Therefore, lobsters of various sizes were placed in traps of different patterns. No bait was placed in these traps, and although they were left out for twenty-four hours, in no instance was it found that a lobster seven inches long or over escaped from one of the standard traps.

Hon. Mr. Mathieson: That is another point. I am speaking not so much from my own knowledge as from what I have heard. The fishermen say that after a little fishing the bottom of the trap sags and that this inch-and-a-quarter space becomes a space very much wider in the centre. There is ballast placed in these traps to sink them. You have to have a frame which is not very heavy, you have to have it lathed and when you lift it up and down that inch-and-a-quarter space becomes wider, no matter how well you make the trap.

DR. STAFFORD: Two years ago at St. Andrews, New Brunswick, I carried on experiments all summer in connection with lobster traps. I tried all sizes of spaces between the slats from an inch and a quarter to three and a half inches, in endeavouring to test their efficacy in catching lobsters and in holding them after they were caught. I have not the details here, but I have preserved all the data.

DR. ROBERTSON: What is the general conclusion you reached in regard to the size that will let a seven-inch lobster out?

Dr. Stafford: I could not give you that.

Dr. Robertson: Would an inch-and-a-half space let a seven-inch lobster out?

Dr. Stafford: I should think a seven-inch lobster would require a two-and-a-half inch space.

Hon. Mr. Mathieson: You can let a very large lobster through a space of two-and-a-half inches. A lobster can generally go through any space through which he can put his large claw. While the back of the lobster appears to be quite rigid, it is nevertheless, capable of flattening.

Dr. Stafford: I hardly think that is correct, because the lobster's claw is flat and he can put it through quite a narrow space.

Hon. Mr. Mathieson: The fishermen are unanimous in condemning the trap with the inch-and-a-quarter space, and they are all interested in the preservation of the fisheries. They will assure you that it is a regulation that, even if desirable, could not be enforced. The one regulation that can be enforced and will be absolutely protective of the industry is that respecting the time for fishing. They want the season made shorter but they want to fish as they please during the season. You can do that, but you cannot do the other. Whether the space between the laths is an inch and a half, one inch or an inch and an

eighth, it will be impossible to prevent evasion of the law. As the trap is sunk during the fishing season, it is easy to evade the law. I would say, cut the close season down to a definite length of time and enforce it, and you will satisfy every person and preserve the industry.

Dr. Stafford: In Passamaquoddy bay there is no close season on the Maine side. There is one, however, on the Canadian side, and the question is therefore of some interest there. Our Canadian fishermen lose a good deal of trade, or else they make sneak catches and take the lobsters to Eastport and sell them.

Hon. Mr. Mathieson: There seems to be a good deal of faith in the benefits derived from lobster hatcheries.

Mr. Found: If you could protect all the berried lobsters, you would not need any lobster hatcheries.

HON. MR. MATHIESON: The hatcheries are getting great quantities of spawn. I was in a hatchery a few days ago, and they were getting immense quantities and hatching it out well. About ninety per cent of it hatches.

Mr. Found: That is quite true.

DR. STAFFORD: Canada was the pioneer in the work? Hon. Mr. Mathieson: There is a very old hatchery at Pictou.

Mr. Found: It was established in 1891 or 1892.

HON. Mr. MATHIESON: That water is heavily fished and yet it is very productive. You can leave Georgetown and start for Pictou, twenty miles away, and by the time you drop the buoys you begin to pick up lines of traps. There is one continuous line of traps from shore to shore, and yet the factories are doing fairly well.

Dr. Stafford: They take lobsters no longer than my finger. I have seen lots of them no bigger than an English crayfish.

Dr. Jones: The next item on the programme is an address by the Hon. Mr. Mathieson on the "Oyster Fisheries of Prince Edward Island."

# Oyster Fisheries of Prince Edward Island

By Hon. J. A. Mathieson, K.C. Premier of Prince Edward Island

R. CHAIRMAN AND GENTLEMEN,—I shall have to ask the Committee to accept a very informal statement. I am very much in the position of the minister who lost his sermon: my bags and I separated on the way up, and whatever I had in definite form is probably down in the railway station at the present time.

There are just a few general statements that I might make. I do not at all profess to be an expert in the oyster business. My work up to the present time has been largely confined to settling some questions that were in controversy between the Dominion and the Provinces. As the law stood up to the third of May last, there was a divided jurisdiction which had prevented any beneficial action being taken by either government.

In 1865 the Government of Prince Edward Historical Survey Island seems to have wakened to a realization of the value of the oyster fisheries, and a statute was passed in that year providing for the leasing of certain specified areas for the purpose of oyster culture. The only lease that was made was one which is still in existence. It turned out advantageously to the parties who held it and the results, so far as one can judge, augured well for the private culture of oysters in the Province. Then came Confederation and with Confederation came the view that the right to deal with the fisheries had passed over to the Dominion of Canada. That view was held with some uncertainty, but it postponed effective action until 1898. A few leases were granted by the Dominion Government during that period to persons who wished to cultivate oysters within the Province, but very little progress was made. Some did plant oyster beds and were fairly successful at first, but when the rumour went forth that the Dominion leases were of no value, the beds were plundered and were allowed to fall back into a wild state again.

In 1898 the decision of the Privy Council Privy Council Decision, 1898 settled the ownership of the land around the coast within the three-mile limit. The bottoms within this line comprised all the areas that were ever known to have produced oysters. The territory within the threemile limit included all the areas of water within the jaws of the land, such as estuaries of rivers and bays. But there was one qualification as to ownership. By the terms of the British North America Act public harbours were all vested in the Dominion of Canada, and the term "public harbour" has not been defined. The Privy Council refused to define it, so that the situation was such that no surveyor could put down his stake and say: "Here the public harbour ends and yonder is the property of the Province." A harbour may be defined to be any part of a sheltered area of water where a ship may anchor, where she may go for refuge and where she may load or unload her cargo. Under such a definition practically all our waters might be included. The uncertainty on the point would prevent one side or the other from giving title.

Negotiations were carried on between the Government of Canada and the Government of Prince Edward Island from 1900, but without result. We found, when the matter was taken up this last year, that there was an obstacle that had never been considered, and that was that the Government of Canada had no power to grant an exclusive right of fishery even in territory which it exclusively owned; yet, an exclusive right is the only right that is of any value. That power could be conferred only by the Parliament of Canada, and it was necessary as a preliminary step that the terms should be settled and that an enabling statute should be enacted by the Parliament of

Canada. That was done, and in pursuance of the power conferred by that statute the Province of Prince Edward Island made an agreement with the Dominion under which it was granted the right to give exclusive title to private individuals or companies. I may say that Mr. Found, while holding strong views in favour of the administration of the oyster fisheries by the Dominion Government, has, in the course of these negotiations, rendered assistance for which he deserves the very best thanks of our Province.

Having made this arrangement, we are Survey of Oyster Areas proceeding, at the present time, to make a general survey of all the oyster areas within the Province, commencing with Richmond bay, in which the largest areas of live oyster beds are still to be found. Not only are the areas where there are live beds being surveyed, but also all the prospective oyster areas. Richmond bay, which contains about 30,000 acres—these are very rough estimates contains possibly 3,000 acres of live beds. There is no question that all of that area is capable of cultivation where the water is of sufficient depth. Dr. Stafford is well acquainted, I think, with this area. It is one of the last productive areas within the Province. We propose to make a general survey of the whole area, mark the location of live beds on a map and then to lease only those portions in which no oyster fishery exists. With respect to some of the doubtful beds, it will be necessary to make a declaration that they are live beds or that they are not live beds as the case may be.

Proposed Terms of the lease are not yet settled, but the probability is that we shall follow, possibly with some modifications, the terms laid down in the lease proposed by the Dominion Government when it suggested taking charge of these areas itself.

a See Appendix I.

That would be a dollar an acre per annum for the first five years, \$3 an acre per annum for the next five, and \$5 an acre per annum for the remaining ten years of the twenty years' lease, with a provision for renewal at the expiration of the term. Some variations will have to be made. For instance, the minimum area to be leased will vary in different localities. Then, again, there are some sections, in Prince county particularly, where the oyster fishery has been actively prosecuted and the interest of the people has been aroused as to its value. In such places, we shall require to have the areas cut down small enough to enable most of the people who have been actively engaged in the oyster business to get a share. That, I should estimate, might require a minimum area of one acre. When we get outside of these special fields, which are limited in extent, we propose to fix an area of five acres as the minimum area for private individuals. Those who own land near the shore will have the choice of leasing the minimum area within thirty days, we will say, after the results of the survey have been announced and posted.

When this work of satisfying local requirements is done we shall be in a position to deal with the leasing of large areas. Applications have been received for areas exceeding 1000 acres, and I believe the demand will be exceedingly active. I have great confidence, too, in the results to be obtained from the operation of these large areas by companies which are sufficiently capitalized to procure a first-class manager, who will, first of all, prepare and plant the beds, and afterwards, supervise them. The possibilities of development are greater in these large areas than in the very small areas sub-divided to meet local demands and requirements, but, as a matter of public policy, and in deference to the previous interest which has been taken in this fishery, it will be necessary to have some small areas. The greater development in the industry, however, will

come from the larger areas, which will lie outside the smaller holdings. I think that the probability is that the greater part of the local demand will be satisfied by the areas having up to twelve feet of water over them. I am assured that it is possible to carry on the development and cultivation of oysters successfully in suitable waters around the coast at a depth of thirty feet.

That is as far as we have gone. We have a first class engineer at the head of the survey party. The two men now immediately under him in that party will be given charge of similar parties in Kings and Queens counties. We will thus have three parties engaged on the work in the course of a few weeks. By the first of September we expect to commence issuing our leases, and before the close of the season we hope to have made a very decided step in advance in the administration of oyster areas in Canada.

I have not the information to estimate the number of acres we have to lease. I have a figure in my mind, but we might fall far short of it or considerably exceed it. The lowest calculation that has been made by those who have studied the question with some care is, that we shall have available for leasing purposes at least 100,000 acres. If we were to carry the leasing out to thirty feet depth of water, we would have to multiply that figure possibly by three. If we can make such a success of this business as we hope to, we shall have opened up for Prince Edward Island possibilities of development which have not been dreamed of hitherto. It would relieve us of our financial difficulties as a Province, and it would give employment to a very large number of people. The preparation of the beds and the providing of packing material would give employment in the winter time when it would mean so much more than at any other season. It would have a tendency to call back some of our lost population and to hold the natural increase which we have been losing steadily for many years.

I am sorry that I am not prepared to give you anything very specific upon this subject. I really do not know enough about it yet. At some later date, when we have carried our work further along and tested our theories more fully, I hope to give you actual results.

#### DISCUSSION: OYSTER FISHERIES OF PRINCE EDWARD ISLAND

Dr. Jones: We have been very much interested in Premier Mathieson's address.

MR. PATTON: The lease proposed by the Department placed no limit on the number of acres that could be leased to one person or corporation. Do you propose to set a limit of that kind?

Hon. Mr. Mathieson: We have a statute which sets no limit. A previous statute did set a limit of five acres in every case, but at the last session of the Legislature we struck that out, and now it rests entirely with the Government as to what the regulations shall be. We discovered by hearing what people from different parts had to say that five acres was entirely too much in some localities and it was entirely too little to meet the requirements of companies undertaking the development of large areas; so we struck it out. I have outlined in a general way what the intention of the Government is in regard to supplying the local requirements.

DR. JONES: Do people in Prince Edward Island ever talk about oyster monopolies? They are beginning to talk of these in New Brunswick, although signs of monopoly are not very much in evidence yet.

Dr. Stafford: Do you think the term of the lease will be as you have mentioned—twenty years?

HON. MR. MATHIESON: It has not been settled. That was the proposal which was made by the Dominion Government.

Dr. Stafford: There will be no selling outright of the property?

Hon. Mr. Mathieson: No, the statute does not authorize the Government to do that. There will be no transfer of the property in fee simple.

Dr. Stafford: Will the first lessee have the first

opportunity of renewing the lease?

Hon. Mr. Mathieson: Either he or his successor.

Dr. Stafford: Could he at any time sell his lease?

HON. MR. MATHIESON: Yes, but the assignment would require to be registered in the office in which the original lease was filed. It would be absolutely necessary to have the lease transferable.

Dr. Stafford: And to give the man who holds it the first opportunity of getting it again?

HON. MR. MATHIESON: Yes. He or whoever stands in his shoes, either by inheritance or transfer, will have the right.

Dr. Robertson: Is any co-operation planned between the Provincial Government and the man who has the lease, with a view to ensuring the proper stocking and management of the bed?

HON. MR. MATHIESON: Provisions to that effect will be incorporated in the lease in order to prevent depletion at the end of the term. I do not think it would be necessary to make any provision for the development of the area. It seems to me that the payment of rent is sufficient to guarantee that. A man will not hold an unproductive area very long.

Dr. Robertson: That is worth thinking over, as it is something which has been done elsewhere. In a business of that kind, the man who cultivates a small area under lease has no chance of doing much except by rule of thumb unless he has the assistance and co-operation of government. The Government of the Province has means of getting information with regard to the best methods of stocking and managing the beds, which it would be difficult for the private

individual to procure. Could there not be co-operation in that respect, and could not a rising rental charge be collected on the basis of the yield per annum?

Hon. Mr. Mathieson: That would be by royalty, for instance?

DR. ROBERTSON: Yes. Would not co-operation of that kind make the beds far more productive for the fisherman as well as far more profitable for the Government? It seems to me that there is a field there for conservation and utilization by combining the scientific ability which the Government can employ and which the small lessee cannot, with the effort of the oyster farmer. It would mean an increased revenue for both.

Hon. Mr. Mathieson: It is necessary to grant some of these leases for small areas, and we have to consider the question of the cost of keeping accounts for a long period of time. Whatever we are to receive from the smaller areas we will have to receive in rent in a single sum. But, when it comes to the larger areas, we might very well modify the rent on the one hand and balance it with a royalty on the other. That could be done in the case of areas of some considerable size. They are large enough to make it worth while and they are large enough to prevent the cost of administration being very great, but with the small areas a single charge is all we could manage.

Then, as to supplying of information, the Government would always consider itself charged with the duty of furnishing those who are interested in the culture and cultivation of oysters with the very latest and best information available.

Dr. Jones: We shall pass now to the next address, that of Dr. Murray, who will speak on some of the things desired by those who are interested in the fishing industry of Nova Scotia.

## Needs of the Fisheries of Nova Scotia

By Dr. Howard Murray Dalhousie University, Halifax

R. Chairman and Gentlemen,—I was rather hoping that the papers that would be offered before mine came on would be sufficient to occupy the whole of the time to-day, and that I would not be called upon until to-morrow. As I am without any practical knowledge of the subject myself, I have been trying to gather information from some men in Halifax who do know something about the fisheries of Nova Scotia, and trying to find out from them some of the things which they consider desirable.

Although conditions vary somewhat in the different provinces, the chances are that what is regarded as a good thing in one part of a country, will, in general, be regarded as a good thing in the other parts also; and so it is quite possible that some of the desires which have been felt in Nova Scotia may correspond with desires which have either actually manifested themselves in others of the provinces or may, at any rate, be latent in them.

There is no question as to the great importance of the fishing industry to the country. The number of people employed in the actual catching of fish and in the canneries amounts to close upon 100,000, and the value of the harvest which is gathered in from the Canadian fisheries amounts to some \$30,000,000 annually. That is pretty fair; but the conditions are yet not altogether satisfactory, nor are they beyond the possibility of improvement. Some branches of the industry in certain parts of the country have been dwindling away until they have become almost extinct, while others are in a state of serious decline. The number of fishermen has been diminishing during recent years, and it is now considerably less than it was some twelve or

fifteen years ago. It is not to an increase in the catch that the growth of the value of the fisheries is due, but to the fact that a decreasing supply being brought face to face with an increasing demand has caused the prices of only a few years ago to be multiplied, in some cases, several times over. That is not a very satisfactory condition of affairs. In respect of extent of area embraced in them, Canada's fisheries are the greatest in the world. Is there any good and sufficient reason why they should not be the greatest in other respects as well?

I take it that it is a part of our duty to take up and to give serious consideration to anything and everything whatsoever coming under our notice which may have any bearing on the proper conserving of the natural resources of the country, on the proper exploitation of these resources and on the using of them to the greatest possible advantage of the country. Now, some of the desires of the people of Nova Scotia may seem to be pretty far-reaching, but I am glad to have this opportunity of presenting them for the consideration of the Committee. They may be stated summarily as follows:

Deputy Minister of Fisheries

1. They consider that the fishing industry is one of sufficient importance, and that the Departmental work connected with it is great enough in amount, or could easily be made great enough in amount, to justify the appointment of an additional deputy minister under the Minister of Marine and Fisheries,—one who could devote his undivided time and attention to the consideration of matters connected with the fisheries. They believe that a Deputy Minister of Marine and a Deputy Minister of Fisheries would both be able to find sufficient work to prevent them from finding time hang heavily on their hands, and that with this division of labour great opportunities might be opened up for the advancement of the fisheries. They think that if a man could be found

who, besides possessing all the other necessary qualifications for the position, adds to them a practical acquaintance with the fishery business and a good general knowledge of the conditions in the trade throughout Canada and in other parts of the world as well, the chances for the success of this experiment would be very greatly improved; in fact, they regard this as an essential qualification.

2. They consider it most desirable that Fisheries Agency a Provincial Fisheries Agency, somewhat similar to the Marine Agency in Nova Scotia, should be established. The head of this Agency, like the Deputy Minister of Fisheries, should be a man of practical acquaintance with the industry. This Agency would look after the Provincial statistics, would see to the enforcing of regulations, would make itself useful in an educational way throughout the Province, would keep constantly in close touch with conditions throughout the Province, and would form a much needed connecting link between the local trade and the Department at Ottawa. It is not too much to say that in the past it has sometimes been felt that the authorities in Ottawa were not in sufficiently close touch with our local conditions and needs. While the people of Nova Scotia regard the establishment of a Provincial Agency as a desirable thing for some others also of the provinces, they consider that the addition of some ten millions of dollars a year to the wealth of the country from the fisheries of Nova Scotia entitles that province to some special consideration in that respect. With the establishing of such an Agency should also come a complete reorganization of the service in the Province. It is felt that much better service could be obtained by the appointment of fewer officials than there are at the present time and giving them more adequate salaries so that they could devote more attention to their duties.

- 3. There is an imperative demand for a Containers standardization of pickled-fish barrels. At present there is no standardization whatever, and owing to the careless methods which have been pursued in putting up fish, the pickled fish of Nova Scotia and the other maritime provinces of Canada have acquired a very poor reputation in the world's markets and the prices which they have brought have been correspondingly poor. Fish from other countries that are said to be no better in quality than our own before they are put up in packages, command a price of several dollars a barrel more than that which is shipped from Nova Scotia. This has been very injurious to the trade there and that industry is dwindling and becoming demoralized. Even if one were to exercise the greatest care and see that his fish was put up properly, vet the fact that it comes from there would militate against its receiving the same consideration as fish coming from other countries and put up in a standard package.
- Inspection of Pickled Fish

  4. There is a call for an inspector of fish to see to the enforcement of the regulations in regard to a standard package and, when the requirements for this have been complied with, to set on the package the guarantee of his seal.
- 5. There is a call for some one to visit the various fishing stations of the Province to educate the people in the best methods of curing and putting up their fish; the same sort of missionary work, in fact, as was undertaken by the Government some years ago in connection with the farming industry, particularly the dairying industry, with such gratifying results. It is felt that it should be the turn of the fishermen now.
- 6. In connection with lobster hatcheries there is a call for pounds for the protection of the young lobster fry during the defenceless swimming period of their existence, until they reach the crawling stage

when they can do something in the way of shifting for themselves and seeking shelter from the attacks of their enemies. Something like what was suggested by Dr. Robertson is the idea, I imagine, in that connection. Some who are keenly interested in the matter, think that the taking of an infant lobster as far as from a mile and a half to three miles out to sea and then dropping him overboard is simply making him a prey to fish. They think moreover, that if he does survive until he reaches the bottom, the pressure of the water at the depth that would be found at that distance out would be hurtful to him in his then tender state.

Further scientific enquiry in regard to the lobster and his habits is asked for in order that the regulations may be based upon sure knowledge instead of uncertain conjectures. Mr. S. Y. Wilson, who has had some communication with the office of the Commission here, and who seems to be pretty well informed on fishery questions in general, suggests the utilizing of coves or parts of harbours in some such way as might be inferred from the remarks of Premier Mathieson with regard to the results which have been obtained in certain parts of Prince Edward Island. He suggests the prohibiting of the taking of lobsters in these coves altogether and the using of them simply as breeding places.

7. The giving of special encouragement to those who will undertake the cultivation of the oyster, utilizing for this purpose barren grounds or places that are not already natural oyster beds, encouraging them by the granting of leases for a considerable term of years for small fees, and assisting them by furnishing seed oysters or spat at cost price and by guaranteeing them adequate protection in their rights. It is suggested that the Department should conduct experimental plots at various places along the coast for purposes of demonstra-

tion and should in this way, and in other ways also, provide for the dissemination of information among the people.

8. Finally, the bringing about of general results which might in some measure approximate to the results which have been brought about in Scotland through the establishment of the Board of Fisheries of Scotland, is considered a consummation devoutly to be wished. This Board has furnished a model which has been adopted in a number of other countries with most beneficial results, and its adoption in this country has been strongly advocated both by the Fisheries Committee of the Halifax Board of Trade and by the Maritime Board of Trade.

Dr. Jones: Is there any discussion regarding this important and interesting address?

#### A PROVINCIAL FISHERIES AGENCY

Dr. Murray: I have a letter here which I received from Mr. Wilson the night before I left Halifax. I asked him if he would make suggestions respecting the establishment of this Agency in Halifax and the reorganization of the service; or rather, I asked him to try to give me some idea of what he considered would be wanted in that respect, and I received this letter from him just before I started from Halifax, a passage or two from which I may be permitted to read. It is much more authoritative than anything I could say, because it is from a practical man and one who is engaged in the business in a large way. He says:

"The first great necessity is the appointment of a practical staff both at Ottawa and in the different provinces. This proposition has the endorsement of every one in any way connected with the trade. This means the appointment of a Provincial Chief as Agent of the Department, with a sufficient staff to carry out the necessary work in connection with the enforcement of the laws and regulations, which, by the way, is the sole and only reason for the numerous appointments that are now made by the Fisheries Department; but, with a practical staff, it

would be their duty to instruct those engaged in every department of the industry as to what they should do so as to bring about an improvement in their product, which would mean an enhanced value and also an increased volume of trade. It would also be their duty to inspect all or sundry cured fish, brand the same and thereby establish a standard for our product, which would be of the greatest importance to the consumer by guaranteeing the contents of any package so branded.

"It is almost impossible for me on such short notice to do other than guess just how many officials would be necessary to carry out these duties in the Province of Nova Scotia, but I think that better results and certainly more reliable information would be had from, say, a chief and staff of eight or ten officers devoting their entire time and ability to this work, and would cost probably not more than half of what the present appointments now cost the Department, from which the most unsatisfactory results accrue.

"This plan means the appointment of a Deputy Minister of Fisheries with a practical knowledge in general of the fisheries of the Dominion as well as a good general knowledge of the fisheries of the world with which our exports come into competition, and who would know, and be in sympathy with, the aims and ambitions of the people who are handling the industry, and in turn have their confidence and respect, so that the Department's rules and regulations would be considered and carried out.

"This, or some other comprehensive plan, will have to be evolved in the near future or many branches of the industry will be in as bad a condition as the oyster branch, which is generally admitted to be almost or altogether ruined in many districts that were formerly very productive."

Dr. Robertson: Unless Mr. Cowie's paper is to deal with the same thing, I would like to make a few observations.

Mr. Cowie: My paper covers a good deal of what Dr. Murray has said and deals with the question of improving and raising the standard of cured herring, mackerel and such like fish, and perhaps in that particular it would be as well to leave the discussion until I have read my paper. There are several points that are cognate to it that I would like to bring before the Committee.

Dr. Robertson: Perhaps I had better defer what I have to say until I have heard Mr. Cowie's paper.

Dr. Jones: Perhaps, then we had better defer the discussion until after Mr. Cowie has presented his paper.

Dr. Robertson: There are several points in Dr. Murray's address that I would not like to have overlooked.

Dr. Murray: I forgot to bring in any mention of the shad fishery, but, inasmuch as that has been dealt with by a commission whose report is now before the Department, I think I need not say anything about it.

Dr. Jones: We have an exhaustive paper on the shad fishery by Dr. Prince, which is to be read.

Shall we hear Mr. Cowie's paper or go on with the discussion of Dr. Murray's address?

Mr. Cowie: My paper covers the same subject. Dr. Jones: Then we will have the paper now.



## Sea-Fisheries of Eastern Canada<sup>e</sup>

By J. J. Cowie

Department of Marine and Fisheries

Mr. Chairman and Gentlemen,—I am extremely pleased to meet you here and to have an opportunity of saying something concerning the great fishing industry of this country. It has always struck me as rather unfortunate that, away from the coast line, there exists an astonishing lack of appreciation of the magnificent resources stored up in the waters which wash our extensive seaboards, and of the importance of an industry from which at least a quarter of a million people (taking the active workers and their dependents) directly derive their daily bread. You, gentlemen, as a matter of course, possess a greater knowledge of the industry than most people not immediately concerned with it; nevertheless, I hope my knowledge of the subject may enable me to say something to you of an interesting, and perhaps useful, nature.

I propose reviewing briefly from their genesis onwards, the various branches of the sea fisheries of the Atlantic Provinces; not for the purpose of indicating any need for conserving or nursing our eastern sea-fishery resources—because I do not think any such need exists, except in the case of our shad and shell fisheries—but rather for the purpose of showing something of the great need for stimulating our fishing population to make much more of the great resources lying so readily to their hands.

The fishing grounds adjacent to the shores of Nova Scotia, New Brunswick, Prince Edward Island and Quebec are unexcelled in their suitability for the maintenance of the most valuable varieties of commercial fishes. A study

<sup>&</sup>lt;sup>a</sup>The material for this address is largely taken from a paper on the same subject prepared by the author for *Canada and its Provinces*.

of the geographical position and the configuration of the seaboard of those provinces brings home the fact mentioned. From the international boundary line at the mouth of the bay of Fundy, to Labrador, the coast line is broken into innumerable, perfectly sheltered, natural harbours and coves, affording incomparable facilities for the formation of fishing settlements and for the carrying on of fishing operations with the least possible expense, risk and exposure. From whatever point of view the magnificent fishing waters of Eastern Canada are regarded, whether as a means of providing and maintaining a distinct industry, such as breeds hardy, skillful seamen, or as a means of supplementing the earnings of those dwellers by the seashore who engage in the necessarily limited cultivation of the soil, they present themselves as a splendid heritage, which forms one of our finest natural resources.

#### EARLY HISTORY

The earliest and best account of the cod fishery as prosecuted by the fishermen of Northern France, off what is now known as the Atlantic coast of Canada, and of the first efforts towards the establishment of a sedentary or fixed fishery on the shores of Acadia, is given to us by Monsieur Denys in the book called "Description and Natural History of the Coasts of North America" (1672). In those early days Normandy and Brittany sent out yearly from 200 to 250 vessels, with crews of fifteen to eighteen men, to engage in the "Bank" fishery for cod. At first this cod fishery was prosecuted as an off-shore fishery entirely. By-and-by, when to some extent the coasts of New France had been explored, it was realized that every creek and cove was just as abundantly stocked with cod as the "Grand Bank" itself: and so, many of the vessels from France, instead of remaining on the "Banks" in the open Atlantic, sought some sheltered

harbour, where they were moored and stripped of their sails. The crews lived in temporary huts on shore, and fishing operations were carried on in small boats—the vessels themselves being used meantime as store-ships for provisions and salt. The fish were dried on shore, and at the end of the season placed on board the vessels and taken to France, all hands going back with them. In course of time it became customary for many of the fishermen to remain on the western side of the Atlantic during winter, instead of returning to Europe in the vessels. M. Denys was the first of these pioneer Frenchmen to realize the possibilities in a proper prosecution of the shore fisheries of New France, by the establishment of a sedentary fishery, and in spite of misfortunes of various kinds, he at last did successfully establish stations at several points along the Gulf shore, thus foreshadowing the extensive sedentary shore fishery that was to be.

During the struggle between France and Great Tersev Merchants Britain for supremacy in the New World, fishing establishments were so frequently seized and destroyed that development came to a standstill, and the industry was reduced to a most uncertain and unprofitable condition. Immediately after the final conquest and the surrender of Canada, in 1760, the attention of an enterprising merchant of the island of Jersey was directed to the cod fishery of the new country, and he began operations on various parts of Cape Breton and the Gulf coasts. Others from the same island followed this lead, and by their admirable system of catching and curing the fish, rapidly amassed considerable fortunes. With the advent of the Jersey merchants, the fishery began to expand, and to assume, for the first time, proportions of real importance. It is recorded, however, that the Jersey merchants discouraged the catching and curing of any kind of fish but cod, and to that attitude of theirs is largely due the neglected state of the herring and mackerel fisheries on various parts of the Gulf for many years.

The Loyalists The coming of the Loyalists at the close of the American War of Independence increased the meagre population of Eastern Canada. These people settled mainly along the coast line, and finding on the one hand, such a wealth of fish at their very doors, and on the other, that climatic conditions were not so conducive to easy farming as were those of their old homes in the south, they took to fishing as the surest and simplest means of supplying their immediate wants. Thus, many fishing villages sprang into being on all parts of the coast, each adding to the importance of the now rapidly growing fishing industry. Independent boat fishing soon became common, and in the course of time, with the growth of population, all kinds of fish came to be taken and marketed.

For a hundred years after the coming of the Loyalists, operations were confined to fishing in the inshore waters. In 1873, out of a fleet of 15 vessels belonging to Lunenburg, 5 sailed for the "Bank" fishery for the first time, and by dint of perseverance and the inspiration of individual successes, the fishery increased, and to-day it is prosecuted in a great fleet of beautiful, yacht-like vessels, mostly built and owned in Lunenburg.

## PRESENT CONDITION OF THE FISHERIES

The fisheries of Eastern Canada at the present time fall thus into two distinct divisions, the deep-sea and the in-shore or coastal fisheries.

In-shore Fishery is the more important of the two, inasmuch as it employs about eight men for one that is employed in the deep-sea fishery. It is carried on in boats carrying two or three men, and at a distance of from one to five miles from the shore. A small class of vessels, carrying four to seven men, is also used

on the nearer "banks" lying twelve to fifteen miles out; while many fixed fishing contrivances, such as traps, dragseines, and weirs, are operated from the shore. Boats engaged in the hook-and-line fishery leave harbour about daybreak and return in the course of the afternoon, while vessels of the small class remain two days and sometimes a week on the fishing grounds before returning to harbour.

The kinds of fish taken from the in-shore waters are cod, hake, haddock, pollock, halibut, herring, mackerel, shad, alewives, smelts, flounders, swordfish, sardines, salmon, lobsters, oysters and clams. Herring is the chief baitfish used in line fishing; but when these are scarce, clams are largely used as a substitute. Squid, a kind of cuttlefish, when obtainable, is a favourite bait.

The deep-sea or bank fishery is pursued in substantial fore-and-aft rigged sailing vessels of from 60 to 100 tons, carrying crews of from 12 to 20 men. Operations are conducted on the many shallow stretches known as "banks" which lie between the outer edge of the in-shore area and the deeper waters of the Atlantic, ranging from the "Grand Bank" lying southward of Newfoundland to "Browns Bank" off the western end of Nova Scotia, also on the many banks in the gulf of St. Lawrence, around the Magdalen islands, and between Cape Breton and Newfoundland. The fish are split and salted down in the hold of the vessels at the end of each day's fishing, and when the hold is full, or the supply of salt gives out, the anchor is hove up, and a course shaped for the land. The kind of fish taken by vessels on the off-shore grounds are cod, haddock, hake and halibut.

In the course of the fifteen years from 1870 to 1885, a steady advance was maintained in the value and importance of the fisheries of the four eastern provinces. The value of all kinds of fish caught by the fishermen of those provinces during the former

year amounted to \$6,312,409, while in the latter year the value rose to no less than \$14,780,584. In all of the four provinces there were employed in 1870, on board of vessels and boats, 27,385 fishermen, while at the end of the fifteen-year period in 1885, the number had increased to 51,498. In looking at the results for the period from 1885 to 1910, the discovery is made that little or no progress had taken place during those twenty-five years. The aggregate value in 1910 shows an increase of only \$834,900 over that in 1885, while the increase in the number of men engaged only amounted to 683 in the course of a quarter of a century.

Of all branches of the fisheries of the east, the most important is the cod fishery, and so far as money value is concerned, it remains the leading branch of the Atlantic coast fisheries. The counties along the south shore of Nova Scotia produce the largest quantities of this fish; but the majority of the fishermen of this district give their whole time and attention to fishing, and are in possession of a fine type of fishing boat. These facts account for their success in this as in other branches of the industry.

Of all the cod-fishing waters of Eastern Canada, probably the most prolific are those of the gulf of St. Lawrence, around the Magdalen islands, on the north and east coasts of Prince Edward Island, the north coast of Cape Breton and in Chaleur bay. In addition to this, the shores of the Gulf are rendered exceptionally advantageous for fish-drying, owing to their immunity from the fogs that sweep in upon the southern or Atlantic coast of Nova Scotia; and there can be no doubt that but for the inferior type of boat used, and the fact that many of the fishermen around the shores of the Gulf cease operations during the very height of the season to attend to the work of the farm, the value of the cod fishery of that portion of our coasts could be enormously increased.

The catches of both the in-shore and the off-shore fishermen are mostly all split and salted for drying purposes. There is a vast difference, however, between the dried products of the two modes of fishing. Cod that is split on board of a deep-sea vessel is heavily salted, in order to preserve it during the fishing voyage, which sometimes lasts a couple of months; and being so thoroughly impregnated with salt, it does not make good dried fish, but is apt to become slimy when transported to hot climates. On the other hand, in-shore fish are landed daily, split, and placed in salt for a short time only, then dried. The curing is, therefore, due less to the salt than to the action of the sun and air, so that fish cured in this manner may be safely exported to hot climates and stored there without deteriorating. To overcome the difficulty, caused by the frequent presence of fog on the shores of the bay of Fundy and on the southern shores of Nova Scotia, drying by artificial means has been resorted to. This consists of a system of steam or hot water piping, over which are placed trays containing the fish. They are there submitted to a temperature of 90 to 95 degrees Fahrenheit for a few hours, and when thoroughly warmed, alternate currents of cool and warm air are forced over and under them, the moisture being meantime carried off by suitable ventilators. Drying by this process is accomplished in about forty-eight hours, as against three weeks by the sun and air process.

The chief markets for dried cod are found in Italy, Spain, Portugal, Brazil, the West Indies and the United States. The largest and best fish are sent to Europe and Brazil; and the inferior kinds to the West Indies. The total value of cod taken by the fishermen of Eastern Canada during the year 1909-10° amounted to \$3,847,844.

Haddock, hake and pollock are taken largely by the in-shore fishermen while fishing for cod.

This refers to the fiscal year ending March 31, 1910. Elsewhere in this paper, also, the year 1910 means the fiscal year 1909-10.

Haddock are abundant in the bay of Haddock Fundy, in the waters along the whole Atlantic coast of Nova Scotia, and in the southern portions of the gulf of St. Lawrence; but they do not frequent the northern shore of the gulf. The chief haddock season occurs in the latter part of the year, at which time the fish swarm into the bays and harbours of Nova Scotia and New Brunswick. when great catches of them are made by boat fishermen. In the spring and summer, haddock are mostly split and dried, and are marketed chiefly in the West Indies. In the fall and early winter, the catches are mostly shipped in a fresh state or as smoked finnan haddies to the inland towns and cities of Canada. The value of the haddock catch in 1910 amounted to \$829,553, seven-eighths of which was produced by Nova Scotia.

Hake abound in all the coastal waters of Nova Scotia, New Brunswick and Prince Edward Island. They are split, salted and dried, and being an inferior kind of fish, are shipped almost entirely to the cheaper markets of the West Indies. The aggregate value of hake in 1910 amounted to \$367,439.

Pollock abound in the waters of the Atlantic coast of Nova Scotia and in the bay of Fundy only, being very abundant near Grand Manan and the other islands at the mouth of the bay. Like hake, they are split and dried, and marketed in the West Indies. The value of these fish taken in 1910 amounted to \$325,533.

Halibut are usually found wherever cod are met with. The fishery is not, as a rule, prosecuted as a distinct one, the fish being taken in considerable quantities by the cod fishermen. These fish generally inhabit deep gullies near the shore or between the "banks."

The annual catch of halibut has not increased in the course of the last twenty-five years; but being a fish that

is consumed fresh, its value has in recent years been enhanced considerably by means of improved facilities for transporting it to inland centres of population. At one time fishermen, when anxiously fishing for cod, looked upon halibut as a pest; now it is commonly worth eight or ten cents a pound as it comes from the water. There were 14,970 cwts., valued at \$153,400, taken in the year 1910, about six-sevenths of which was taken by Nova Scotia fishermen.

Although the herring fishery falls below some others in money value, it is in some respects the most important of all the Eastern Canadian fisheries, inasmuch as the success or failure of the great hook-and-line fisheries depends to a great extent on abundance or scarcity of the supply of herring for baiting purposes.

In the spring of each year, without fail, large masses of herring move close in to the shore, and are literally washed up on the beaches, in many parts of the gulf of St. Lawrence, especially. The mode of capture is by fixed trap and gill nets set close to the shore, and, so long as the mass of fish remains in-shore, large quantities are taken. The spring herring is poor in quality; but it provides an abundant supply of fresh bait for the cod fishing fleet in its first voyage to the "banks", while much of it is salted and stored for baiting lobster traps throughout the lobster fishing season. In the summer and fall, herring of an extremely fine quality abound; but they do not come so near the shore as in the spring, and, as a consequence of the use of the same fixed fishing gear, the summer catch is a small one. Thus, not only are the operations of the great cod fishing fleet seriously hampered for want of a steady supply of bait when most needed, but only an insignificant quantity of this summer herring of unsurpassed quality is prepared for consumption as food.

It has been demonstrated by an experiment conducted by myself, that, by the use of what are known as drift nets such as are used in the British herring fisheries, abundant supplies can be secured through all the summer months, ten, twenty or thirty miles from shore; and if our fishermen could only be prevailed upon generally to adopt similar methods, a large increase in the value of this fishery would be insured.

The total value of the herring fishery of Eastern Canada in 1910 amounted to \$1,702,493; but it has to be recorded that twenty-five years earlier the value obtained from this fishery by the four eastern provinces amounted to \$2,016,019.

In the light of the extreme abundance of Improved herring on the Atlantic coasts, it is to be Marketing deplored that this branch of the fisheries is as yet practically undeveloped. Of the comparatively small proportion of the annual herring catch that is smoked and cured in pickle. part is consumed in Canada and part exported to the United States and the West Indies; but owing to careless packing and badly made barrels, the price obtained is not such as to induce those engaged in the business to increase the output. I may say that I have placed in the hands of the Minister of Marine and Fisheries a scheme with all the necessary details, for raising the standard of curing and packing by a system of inspection and branding on the model of the Scottish one, and for introducing a more substantial barrel for transporting the cured article to market. The scheme is at present under consideration. but it may be permissible to say here that its salient features are:

(1) The payment of a bounty to fishermen or other packers, on all barrels made in accordance with requirements, and filled with pickled herring, mackerel, alewives or salmon. This aims at bringing into common use a strong standard barrel.

- (2) The branding of such barrels with a particular mark as a guarantee of the quality of their contents, provided the fish are, as a result of careful examination, deemed worthy of such brand or mark.
- (3) The creation of a sufficiently qualified staff to undertake the work of inspection and branding.

Should the scheme be adopted and the necessary legislation secured for its operation, I am confident that it will give to the pickled fish industries a much needed and long overdue fillip.

A very important sardine fishery is carried on in Passamaquoddy bay, New Brunswick, and the waters around the islands of Grand Manan and the West isles at the mouth of the bay of Fundy. It is the only one of its kind in Canada. Strictly speaking, the fish is not a sardine at all, but simply a young herring. It is an established fact that the true sardine is the young of the pilchard, and the pilchard is not found in the waters of Eastern Canada.

This fishery has been the means of building up a notable canning industry in the course of the last thirty years. When the canning of these fish commenced, considerable quantities were canned in establishments on Canadian soil; but the United States, being the chief market for the canned sardines, the government of that country, by placing a prohibitive duty on the manufactured article, while granting free admission to the raw material, practically transferred the canning industry from Canada to the nearby towns of Eastport and Lubec in the state of Maine; so that now the fish are supplied by Canadian fishermen from Canadian waters, and canned mostly on United States soil.

The value of sardines taken by Canadian fishermen belonging to this small section of the coast, in the year 1910, amounted to no less than \$551,204.

The gaspereaux (commonly called alewife), although of the herring family, ascends rivers to deposit its spawn in fresh water. It is found in the bay of Fundy, on the Atlantic coast of Nova Scotia and along the south shore of the gulf of St. Lawrence, as far as Miramichi bay. It is most plentiful, probably, in the bay of Fundy. The annual catch amounts to about 25,830 barrels. It is mostly used as a bait fish; but considerable quantities are salted for food.

As Dr. Prince is to speak on the shad fishery, I shall say nothing of it except that the records for the year 1870 disclose the fact that there were 11,659 barrels taken in that year; but from that date down to the present, there seems to have been a gradual decrease in the annual catch, till in the fiscal year 1909–1910 it amounted to only 5,293 barrels. A special commission recently investigated this fishery, and it is expected that the action taken on the strength of its recommendations will result in arresting the further decline of the fishery.

Smelts abound on all parts of the eastern coast of Canada and furnish an important industry. The fishery is at its height in the last part of the year, and, when the rivers freeze over, enormous hauls are made through holes in the ice. The year 1910 produced no less than 91,000 hundredweights of this fish, amounting in value to the very considerable sum of \$849,872. It is taken in greatest numbers on the Gulf shore of New Brunswick. That small section of the coast alone produced in the year named over 72,000 hundredweights, valued at \$723,000. The home markets absorb a large quantity of smelts, but the bulk of the catch is shipped in a frozen condition to the United States.

The mackerel fishery is a very important Mackerel one on all parts of the seaboard of Eastern Canada. While little of an accurate nature is known concerning the annual appearance and disappearance of mackerel, it is well known that they appear annually off the mouth of the bay of Fundy about the middle of May, and at various points on the coast of Nova Scotia as the season advances, until in June they swarm into the Gulf. From that time they are found more or less abundantly until the early part of November, when they disappear entirely from Canadian waters. The gulf of St. Lawrence perhaps furnishes the most favourable conditions under which mackerel exist-smooth water and an exceedingly plentiful supply of food. Fixed traps and gill nets are used for their capture, as in the case of herring, besides hooks and lines.

With all due allowance for the erratic movements of mackerel, it must be admitted that this fishery is prosecuted at the present day in only a half-hearted manner. Twenty years ago it produced a value of almost \$2,000,000, while during the last ten years its value has risen and fallen between \$800,000 and \$1,600,000. This fishery, like the summer herring fishery, might be expanded immensely by the adoption of different methods of fishing and the exercise of judicious care in curing the fish, and packing them in strong, well-made barrels. Three-fourths of the mackerel catch of Canada is cured in pickle, the chief market for the pickled product being in the United States.

In addition to the extensive hook-and-line fishery for salmon on the many well-stocked rivers of the East, there is carried on, during the open season, along the whole coast line, a very considerable net fishery. The New Brunswick counties of Northumberland, Gloucester and Restigouche, which border on the Gulf, and the Quebec counties of Bonaventure, Gaspe and

Saguenay, are the greatest salmon-producing counties in the eastern provinces. Saguenay, which produces from five to six thousand hundredweights annually, heads the list. The total salmon catch during the season of 1910, both by hook and line and by net fishing, amounted to 31,066 hundredweights, the value of which was placed at \$413,485. That represents a distinct and gratifying increase when compared with the catches of eight or ten years ago.

As Mr. Found is to speak of the lobster fishery, and the Premier of Prince Edward Island and Dr. Stafford of the oyster fishery, I shall say nothing of those two branches.

other Fish In addition to the kinds of fish I have dealt with, there are several less important kinds, such as tom-cod, flounders, eels and bass, which in the aggregate add appreciably to the annual value.

Fishermen on the Atlantic coast of Nova Scotia have lately given some attention to the taking of swordfish. These fish weigh on the average about 300 pounds, and realize to fishermen about ten cents per pound.

Although seal hunting can scarcely be classed as a branch of the fisheries, nevertheless, being part of the resources of our eastern seas, it may be mentioned, in passing, that in the gulf of St. Lawrence—chiefly around the Magdalen islands—an important seal hunt is made annually on the ice in the spring. In a good year as many as 40,000 seals are killed and landed at the islands.

Notwithstanding the fact, already menbevelopments tioned, that the aggregate value of the fisheries of the east has stood still for a quarter of a century, there are some recent indications of advancement. Our cod, haddock and such fisheries are gradually undergoing a change from preponderating salt-fish businesses to freshfish ones; and herein lies the hope of reanimation. Boat fishermen have become alive to the fact that, in order to

meet the demands of the rapidly growing fresh-fish trade, they must be able to reach port from the fishing grounds with their perishable cargo in the shortest possible time; and so to-day we find no fewer than 2,304 boats belonging to the eastern fishery fleet fitted with gasoline engines, and in a position to make speed through head winds and calms.

Since 1908, steam trawling, the latest and most successful mode of capturing large quantities of fish ever put into operation, has been tried in a small way on the coast of Nova Scotia. This method consists in the dragging, by a steam vessel, of a strong, bag-shaped net over the sea-bottom, for the capture of all kinds of fish.

It is a fact that wherever this style of fishing has been introduced, it has been denounced in the most decided manner by fishermen who use hooks and lines. They, not unnaturally, fear, firstly, the effects on the fresh-fish markets of the greater catching power of the trawler; secondly, the depletion of the in-shore fishing areas by over-fishing, and lastly, the possible destruction of their fishing gear by the sweep of the trawler's net.

Trawling is an expensive mode of fishing, and requires a large and ready outlet for all kinds of fish in their fresh state, at good prices, the price of salt fish being generally too low to permit of profitable working for that trade alone. There is, therefore, some reason for the fears recently expressed by Canadian line fishermen that a rapid development of this mode of fishing would so continually oversupply the, as yet, limited, though growing, fresh-fish markets of Canada as to render both line and trawl fishing unremunerative.

With the increasing application of modern methods, arises the question: Will the vaunted abundance of fish in Canadian waters remain unaffected? This question can

only be answered by a study of the records of the fisheries of European waters, where steam trawling has been carried on so long, and where the fleets are so large. There, in the comparatively narrow North sea, what would in Canada be called excessive fishing to a superlative degree goes on from January to December, year in year out, by an immense fleet of trawling and other steam vessels without let or hindrance except within the three-mile limit.

I would merely point out here, that climatic conditions in Canadian waters provide a natural protection against depletion. For three or four months in each year there is an enforced close time, during which little or no fishing takes place, and during which even the operations of steam trawlers would be brought to a stand-still, owing to the severity of the weather. Indeed, the gulf of St. Lawrence—that immense fish-breeding area—is virtually closed to fishing from December to May, which period, mark you, covers the spawning season for cod, haddock, hake and such fish.

In view of the fact that it would be utterly impossible to convince the government of France as to the alleged ruin the method works on the "banks," I do not see how trawling can be totally prohibited on this side of the Atlantic, I would, however, heartily welcome some international arrangement whereby trawling might be prohibited within at least twelve or fifteen miles of the shore, and regulated for the benefit of the thousands who depend for their livelihood on what the baited hook captures.

Being responsible for the proper collection of all fisheries statistics and the publication of the same, I should like to say a word in closing as to the methods of obtaining them. The primary object of the collection of such statistics is, of course, economic. Data concerning an industry which affords employment for large numbers of our population, and for large amounts of capital are clearly necessary for the use of the economist and the

statesman. Another and wider field is open to the statistician. Many of the problems which arise in connection with the exploitation of the sea may be attacked, and probably in the end, solved, by the careful collection of statistical data.

Until within the last two years, Canadian fisheries statistics have been looked upon as rather unreliable. I found on taking hold of the work, that the cause of this lay largely in the defective methods of collection put into practice on the coast; also to defects in the forms on which returns were made up by the collectors, whereby many kinds of fish were recorded more than once on the same form. This has been changed by placing in the hands of the collectors forms calculated to avoid duplication and confusion in filling them in. Formerly statistics were gathered at the end of the year only. Now sea-fishery statistics are collected in every little section of the coast every month. transmitted to the Department, checked, verified and published in the form of a bulletin in the course of each succeeding month. Thus is insured the publication of figures of a more accurate nature in the annual reports of the Department, which should henceforth be of the utmost value in dealing with questions that may arise relative to the conservation of our fisheries resources.

#### DISCUSSION: CURING AND MARKETING OF FISH

Dr. Jones: I am sure that we are very much indebted to Mr. Cowie for his exhaustive paper. We are ready now for the discussion of it and Dr. Murray's suggestions as well.

Dr. Robertson: I would like to make a suggestion or two partly in relation to these two papers of Dr. Murray and Mr. Cowie, and partly as my own contribution to the plans of this Committee. I come to this subject without much scientific knowledge of fish or fishing, except that which is got by the amateur fisherman, who can sometimes tell stories better than he can fish. But, looking at it from the point of view of an agriculturist, I have been concerned most with the thought of how this Commission could assist in increasing the food values of the fisheries and improving the markets for the fish that the fishermen catch. Conservation means preservation and we have been considering how we can preserve abundance of fish by means of regulations to control the methods whereby fish are caught and the size at which they may be captured. Then, we help preserve by propagation at fish hatcheries. Through our Secretary we may furnish general information, as hinted at by Dr. Howard Murray, to the fishermen on the habits of sea-fish and fresh-water fish, in order that they may not destroy the young too soon and may not prevent the propagation of fish in the best habitats for them.

I discuss the problem now more from the standpoint of making the best use of what is caught. I think we do that very badly in Canada now. I do not know any part of the world in which I have travelled where it is so difficult to get decent fish, as soon as you leave the sea-coast, as in Canada. I did not find any trouble in Europe last year and it should be possible to get good fish regularly in the interior of Canada. It is not well to argue widely from personal experience only, but I do like fish as food and I am only one of thousands who like fish as food. I have been over this country very often from coast to coast and unless the Department is taking some steps to improve the means whereby fish is delivered from the fishermen to the consumer, this Commission ought to do something. I do not think we ought to encroach upon departmental activity, but we might suggest lines of activity for the Department to pursue, or we might, through the Department, or otherwise, carry on an investigation as a part of our duty. If the Department is taking the matter up, we might co-operate with it in dealing with such questions as this. Any suggestions I make are made with a feeling of diffidence,

because I do not know whether the Department has already begun to do the things that I am about to suggest. If it is doing them they have not yet been done very effectively or successfully, because we find it almost impossible to get decent fish. I have given up eating fresh fish, or so-called fresh fish, because I cannot get it. It comes to us out of cold storage with a suggestion of boracic acid or formaldehyde or some of those things the thought of which makes it undesirable.

I had a good deal to do with the introduc-Abuse of Cold Storage tion of cold storage on railways and in warehouses in Canada, and I regret to see that the cold storage facilities have fallen into the hands of men who are using them not to serve the public by means of improved transportation, but who are using them for speculative purposes to hold goods for long periods and then palm them off on the public in a preserved and rather undesirable condition. We should take steps to stop that. I do not know any food product which lends itself to cold storage manipulation with worse results than fish, or to an extent that is more damaging to the consumer. I do not think that anything can deteriorate more in flavour and with worse results to the digestion. By prolonged cold storage we get the fish preserved in a way that leaves it in a very bad state for nourishing the body or pleasing the taste. We should have the facilities for the quick transportation of fish improved until it can be placed upon the market in a really fresh condition. A similar state of affairs exists in our meats trade. I feel that there is danger in holding cold storage fowls. They are held so long that while you can regard them without offence to the taste, the smell or the sight, they are nevertheless unwholesome. I consider that a most undesirable condition. There is a good and a bad use of cold storage for fish and other food products.

We might have an investigation conducted Curing of Fish to see whether a fish, mild cured at the place of catching, would not be a far safer thing to eat in the West than a so-called fresh fish. We all use salt on fish. I know that if I have a catch of trout and want to carry them for a few days, when I cut them properly and put a sprinkling of salt upon them, they will be good for several days afterwards. It seems to me that we might conduct some investigations along this line. I do not know but that we might have a mild pickle cure for fresh fish and send them inland in that state. I do not mean the pickle of thoroughly salted and double-cured herring or mackerel or even the cod which is dried afterwards, but a mild cure such as you get in the haddock before it is smoked. used to get these haddocks from St. Andrews, N.B. It is a question of increasing the consumption of fish by three or four times and of affording the people a more palatable food. You might in this way be able to transport fish away beyond Winnipeg in a better state of preservation than you could by cold storage. The Royal Commission on Technical Training and Industrial Education made some enquiry on this point when we visited the coast of the Maritime Provinces, but we could not find that there had been any effort to furnish the great prairie market with cod fish so preserved—an article of food which I am sure would be far superior to the cod that is sent to the West Indies, Italy or Spain. If we could get the mildest of cure into our cod fish, we would have a fine fish food for the It would be a good thing if this Commission could have some experiments conducted with a view of discovering the best means of preserving and utilizing the products of the fisheries.

I am glad to hear from Dr. Howard Murray that what is desired for Nova Scotia—and I think it is desirable for other provinces as well—is a scheme whereby the fishermen will receive instruction from and be given demonstrations

by competent authorities. In the course of our investigations abroad we saw some of the schools for fishermen in foreign countries and a very good summary of that part of our investigation was presented in the report of Professor Sexton, of Halifax, N.S. I asked him to go to the school for fishermen at Geestemünde in Germany, and we also visited schools of the same character at Aberdeen and in the county of Fife in Scotland, as well as at Piel, near Barrow-in-Furness, and at Grimsby and Hull, in England. I think we can learn much from all these places and their efforts to instruct fishermen in regard to the habits of fish, means of catching fish, methods of curing fish, navigation, the control of motor boats and kindred subjects.

I think we might do good by having a Instruction in Fish Curing number of competent travelling instructors going around to fishing centres to give the fishermen information on the-I do not know what to call it-first treatment of the catch, I presume would be the most apt phrase. I have been amazed at the want of good sense in the first handling of fish towards curing or partly curing them for the markets. The practice seems to ignore modern ideas as to the most efficacious means of preserving fish in the best condition. I am quite sure that a travelling school of three persons spending a week in a place could do for a whole locality what the travelling dairy did for the butter industry of Nova Scotia. If such a campaign could be organized, it would bring about a much desired improvement in the methods of preparing fish for market. should be a demonstration of methods with sufficient explanation to make it clearly understood by the people. We learned that a little of that instruction was being given abroad, but not so much as we need because of our great distances from the market, the condition of our people and the value of our fishing industry. I would like to see this Committee present a report in favour of the establishment of schools of instruction and the appointment of travelling instructors and demonstrators to inform the fishermen and others engaged in the industry as to the best method of taking care of what is caught. I think that with five years of aggressive work we can add at least fifty per cent to the value of the catch that is brought to land.

I have found great need in Canada for pursuing good business methods in the cleaning, packing, grading and branding of our fish. In places where large quantities are handled there is an immense loss, which ultimately comes back on the fisherman, from want of reliability or uniformity in regard to the quality that makes up any given lot. The merchant naturally tries to sell everything that comes through his hands and to make money in doing so. If demonstrations, similar to those which are given in orchards to teach the grading of apples, could be given at various fishing centres, a marked improvement in the conditions could be brought about. Great benefit would result to the fishermen if they could be shown the advantage of properly selecting and grading their fish, and if they could be convinced that selection would prove much more profitable than the sale of their product in an unclassified heap.

Appointment of a Committee for the appointment of an expert—I would rather say the appointment of experts—I do not know how much money is available, but I do know from my general reading how much money is at stake, because the earnings of 100,000 people and a product of \$30,000,000 annually—and that could be very much increased—are involved. A good deal of improvement might come through the employment of competent experts, who would not meddle, but who would manage to help the people and thus enable them to do better for themselves.

In this connection I refer again to what I have already suggested, viz., that if there is no information available now on the practicability of mildly curing a large part of the

catch which is meant for the interior market, we should try to investigate that question and get information on it. We should have some one to carry out investigations of this kind. I think we could, in these respects, and particularly by directing our attention to a better utilization of the catch, render a good service to the Department, to the public and to the fishermen. That is why, when we come to consider the appointment of experts, I would press quite strongly, for the employment of a man who understands fish, their life history, haunts and habits, and for the appointment of a man who is as well, a competent authority on preservation, marketing and transportation methods. I believe in having one or more experts who would be available for conference in the provinces, whom the provincial governments, the local boards of fishermen and the railways might consult, because such experts could render valuable service to the fishermen and the fishing industry.

Uncertain
Transportation
Tion that enters into the matter of the distribution of the fish supply that closely affects our Province.

I refer to the question of transportation. It has often been the case that we would have to pay eight cents a pound for fresh cod in Charlottetown in the spring, while at the same time it could be bought on the shore for a cent and a half a pound—a price high enough to encourage the fishermen. The market is readily glutted with fresh fish by reason of the fact that the means of transportation are uncertain, and this very uncertainty prevents the development of the industry to the extent to which it might be developed.

Overlapping of Fishing Seasons question of an inadequate supply of fish, to which I would like to refer. The seasons for catching

different fish sometimes overlap. At the present time, in the parts I know best, the cod-fishing is first class, but the lobster-fishing is in full swing and the same class of men are engaged in both. The result is that the cod-fishing is neglected. I have found places where you could not buy fresh fish, yet a man could take a row boat there, go out a couple of miles and fill it in a very short time. These conditions co-exist. I have often thought that it might be possible to arrange the seasons for fishing so that during the time when the run of one kind of fish is strongest, the fishing season for another kind of fish might be postponed to some other date, or so arranged that the seasons for the two kinds would not come simultaneously. If the Commission would take that matter up it might be able, by a consideration of the whole question, to effect some changes that would prevent the overlapping of the best periods for fishing.

That and the transportation question are two very important matters. We have been talking a good deal about the size of lobsters and about the small lobsters that are being caught in certain parts, but if transportation facilities were sufficient, the market would call for live lobsters of a certain size and that would very soon provide a remedy for the condition of affairs complained of. Once it was found to be more profitable to export live lobsters, canning would cease and the grievances in connection with this fishing would find a remedy in that way.

What the Department is Doing MR. FOUND: It may be of value to the Committee to know what the Department has been seeking to do along the line that Dr. Robertson has been suggesting. In order to develop the trade in fresh fish, the Department has been assisting in the payment of freight and express charges. Prior to 1907, the larger fish markets of Canada, such as those of Montreal, Toronto and Quebec, were being very largely supplied

during a portion of the year from United States sources. In some instances, notably that with respect to Pacific halibut, the fish had been caught in British Columbia, had gone to the United States and been shipped back again to Canada. The high express rates from the Maritime Provinces rendered it practically impossible for the shippers there to compete successfully with the shippers from Portland and Boston. To Montreal, the greatest centre of consumption, a rate of \$1.50 per hundredweight was charged from Nova Scotia, and only 80 cents from Portland or Boston. Some time ago a duty was put on the importation of fresh fish from the United States which also assisted the Canadian fishermen to some extent. But during the past few years the Department has been assisting to the extent of one-third of the regular express charges on all shipments of fresh fish from the Atlantic coast to all points in Quebec and Ontario; and from the Pacific coast, to all points as far east as Manitoba. By guaranteeing the railway that at least two-thirds of the maximum car-load rate would be earned it has assured shippers of a cold storage car hauled by fast freight, whenever they desire it.

No one has realized more clearly than the Department the desirability and necessity of doing something in the way of enlightening the fishermen as to the best methods of handling their fish after they catch them. To that end an appropriation of \$10,000 was obtained for a fisheries intelligence bureau with the object of bringing before the fishermen in some concrete way such information as would be useful and desirable. The method of doing this has not yet been decided upon. It is a matter that is under consideration and the suggestions which have been given are most helpful. I hope they will be followed up and amplified. Anything that can be done to assist the Department in any way, apart altogether from what this Committee may do itself, will be most thankfully received, I am sure.

Regarding Dr. Murray's remarks, I might state, as the Minister publicly stated some time ago, that it is very clearly realized that the "outside" fishery service at the present time is not what it should be. It is a growth, an accumulation since Confederation, and needs entire reorganization. It must be reorganized, and the Minister will no doubt be able to deal with the matter soon, but just on what lines, of course, I am not at all prepared to say. I merely wish to point out to the Committee that the necessity for it has been realized by the Department and that the matter will receive consideration at a very early date.

HON. MR. MATHIESON: If we in Prince Edward Island had the car ferry, we could get the fish out.

Dr. Robertson: Yes.

Mr. Found: There is a large quantity of fish coming from the east.

HON. MR. MATHIESON: Down there at the present time men can go out and load their boats with cod-fish. But, what is the use? There are no means of exporting them, and the drying of them takes quite a long time.

MR. FOUND: It is the problem of a big country, great distances and small markets.

HON. MR. MATHIESON: There is an enormous market but we have no means of getting our products to it.

The Committee adjourned to meet again at 9.30 a.m. on Wednesday, June the 5th.

### Wednesday Morning's Session

The Committee met on Wednesday, June the 5th, at 9.30 a.m. with Dr. C. C. Jones in the chair.

DR. Jones: We shall now have a paper on the "Shad Fishery of Canada" by Professor E. E. Prince. As Professor Prince is absent from the city, the paper will be read by Mr. James White.

# The Shad Fishery of Canada And its Restoration

By E. E. PRINCE, LL.D., F.R.S.C.

Commissioner of Fisheries for Canada

#### Introduction

ARLY records establish beyond question the abundant and widespread distribution of shad along the shores, bays, and rivers of the Atlantic coast of North America. When the English colonists settled what now constitutes the Eastern States, they found the shad to be one of the most abundant of all the food fishes frequenting the estuaries, rivers and bays referred to. The famous William Penn, in a letter to the Duke of York, dated Philadelphia, January 9th, 1683, gave the information that—"our rivers have also plenty of excellent fish and water fowl, as sturgeon, rock, shad, herring, &c." Few incomers from Europe were previously acquainted with the shad, which is very rare along the shores of the German ocean, though abundant in the Severn, in the west of England, and in the Thames and other rivers. Of the British shad two kinds have been recognized: the Severn shad, four to five pounds in weight, which ascends from the sea to spawn in April; and the Thwaite shad, a smaller species found in the Thames, and which was at one time exceedingly abundant in that river, but is now almost extinct. The New England colonists soon learned to appreciate the excellence of the American shad and in some territories it became a staple food. There were, however, criticisms as to the poor condition of some of the fish caught after spawning, on account of their bony condition, and, as Judd stated in his history of Hadley, Massachusetts, these shad were despised and rejected as not being suitable for food. Mahlon Stacey, one of the first settlers in New

Jersey, wrote in 1680 to his brother in England, "Though I speak of herrings only, lest any should think we have little of other sorts, we have plenty of most sorts of fish that I ever saw in England, besides several sorts that are not known there, such as rocks, catfish, shads and sturgeons."

There are many early Canadian references to the existence of shad in our waters. Thus, in a sketch of the Province of Nova Scotia by Judge Deschamps, dated in the year 1782, speaking of River Habitants, Kings county, N.S., he says, "In July and August this river affords abundance of fish called shad."

#### THE SUPPLY

All the testimony recorded in documents now available, historically establishes the fact that shad were abundant all along the eastern shores of this continent as far north as the St. Lawrence, up which they ascend above Montreal. Indeed, they are stated on reliable testimony to have even been taken in the Ottawa river, ascending almost to the site where the Federal capital now stands.

The Dominion Shad Commission (1908– A Once Plentiful Supply 1910) of which I was Chairman, heard evidence from many witnesses, some of them of great age, referring to the extreme abundance of this esteemed fish. Thus Mr. James Fleming, Folly Village, N.S., ninety-three years of age, said that he remembered the time, sixty-five years ago, when shad were very plentiful. The witness was referring to the Colchester shore of Cobequid bay, and similar evidence regarding the opposite, Hants, shore was given by Mr. Isaac Douglas of Maitland, eighty-six years of age. Mr. Douglas said: "In 1837 men easily filled their small boats, getting three or four hundred shad on a tide. Every one who had a boat then fished and got all he could handle. There was no trouble to get fish." The same venerable witness added, "my grand-father said the bay was alive with fish; it was swarming with shad."

The idea prevailed that the supply of this valuable fish could never be exhausted, though even in the early years referred to there were fluctuations, that is, poor seasons when fish were less plentiful, but never the scarcity which exists to-day.

In the letter written to Dr. Perley by Amos Seaman of Minudie in 1850, we find he entertained this opinion, as he says: "that the supply is inexhaustible, is plain to every one; for notwithstanding the number of persons employed, and the means for capture having greatly increased within the last few years, there appears not the least diminution in the quantity of fish—none complain."

The early settlers along the bay of Fundy, Early Methods especially on the shores of Cobequid bay, of Capture adopted the most primitive methods of securing supplies of shad. The fish were so abundant that large captures were easily made, especially from tidal pools on the wide sandy flats, where such simple means as pitchforks, and later, spears, proved effective for procuring supplies for domestic use. One witness said, "Shad were got on the flats in holes or pools left by the tide. We speared them and got as many as we could carry on our backs; the flats were alive with shad." Brush weirs were soon adopted in these early years. Mr. Adolphus Bishop stated to the Commission that—"He had fished shad from the age of sixteen and he was now eighty years old. Sixty-seven years ago, when he was twelve, he remembered the first weir made of brush, at Ellison point, near Starr point. The owner caught more shad than he could use,—as much as two yoke of oxen could draw. There were big seines, drift nets, pollywogs, &c. There were four seines at Four

islands, Boot island, &c. Big fisheries were at all these places. Everybody caught hundreds and thousands of shad."

All fisheries are subject to fluctuations Fluctuations in the Supply and the shad fishery cannot be regarded as an exception. This may, to a small extent, explain the statements that in former years, forty to fifty or sixty years ago, shad in some seasons were less plentiful than in others, but the present dearth must be regarded as due to other causes than such fluctuations. The serious fact must be faced that for twenty-five or thirty years there has been a marked decline in the supply, while during the last ten or twelve years the fish have been alarmingly scarce. In such places as Scott bay, N.S., where, in 1897, 45,000 shad were taken in one night in a stake seine, the actual catch in 1908 in the seine mentioned was not more than 200 for the whole season; while at the time of the visit of the Shad Commission in 1908, the seine in question only secured three shad at one tide. The only fishery yielding returns of consequence at the present time is that carried on up the rivers, in non-tidal waters, where the last remnants of the shad spawning schools ascend for breeding purposes. The fishery in the tidal waters of the bay is still carried on, but the success of the fishing depends not so much upon the shad taken, as upon the salmon which may happen to be caught in the same nets.

There can be no question of the former general abundance of shad, in view of the remarkable testimony referred to in the preceding pages. During the period of the American civil war, the shad fisheries of the bay of Fundy yielded large returns and were most energetically carried on. The main catches were salted and shipped to the American markets. It is on record that in 1872 three stake seines took 100,000 shad. The extraordinary catches in that bay appear to have depended to a large extent upon

weather conditions; with a west wind and "roily" water the best catches were made, such for instance, as the 45,000 shad taken in a weir on July 17th, 1897, a phenomenal catch in recent years.

Of course, no systematic method of recording statistics existed in the early days of the fishery and detailed figures are lacking for these early years. Indeed, in an official report to the Department of Marine and Fisheries in 1869, it is pointed out that "it is very difficult to get even an approximate statement of the catches of shad." In 1860 the Census returns for Nova Scotia gave the quantity of shad cured in that Province as 7,649 barrels. This quantity was made up in part as follows, the chief counties contributing being:

Colchester	3,691
Kings	1,274
Hants	1,078
Cumberland	652

Most of them were salted or cured, there being no market for fresh shad.

# Causes of the Decline of the Fishery

The salmon has steadily increased in quantity and also in size, an improvement, it is universally agreed, directly due to the propagation of these fish by the Dominion Government hatcheries. While this is true of the salmon, the opposite is manifest in the shad, which has steadily declined for the last twenty-five or thirty years. The latter it may be noted, has not been long included in the Dominion system of fish culture, and has been excluded from proper protective regulations.

Various causes have no doubt combined to bring about the present serious condition of the shad fishery. Amongst these may be mentioned:

(1) Dams and other obstructions in rivers, preventing the parent fish from ascending to their spawning grounds. (2) Capture of the breeding fish when ascending the river to spawn.

(3) Over-fishing by seines, weirs and nets of various

kinds.

(4) The pollution of rivers and feeding grounds by sawdust, mill refuse, and other deleterious substances.

Obstruction by dams and excessive destruction of shad, especially spawning fish in spring, call for a few detailed remarks.

There is no doubt that one of the most Obstruction serious causes of depletion has been the blocking of rivers by dams, which prevent the ascent of the spawning schools of shad. This fact was years ago established in the Penobscot (Maine) shad fishery. In that river shad were extremely abundant, but about thirty years ago, a dam was erected which resulted in almost exterminating the fishery there. In many of the rivers flowing into the bay of Fundy the erection of dams has had extremely harmful results, some of these obstructions being of a formidable character. Other obstructions which have had a detrimental effect are log jams, which undoubtedly deter the ascending schools from reaching the upper waters; while the use of set nets which, it is alleged, are often stretched completely across streams, has done much to prevent the fish reaching their spawning grounds.

Mr. C. A. Stevenson, in his famous report to the United States Fisheries Bureau on the shad fisheries, laid stress on the damage due to such obstructions in the following

words:

"An examination of thirty-three of the principal Atlantic coast rivers, aggregating 7,391 miles in length, shows that shad formerly existed throughout 5,330 miles, or 72 per cent. of the length, and that at present they are to be found in only 3,635 miles, a decrease of 1,700 miles. This includes the principal rivers, and if the minor streams and tributaries were included the total length from which shad have been excluded would doubtless appear more than twice as great. In

much of that length shad were formerly quite numerous; the catch in many instances exceeded the yield in the portions to which the fisheries are now confined."

The limitation in the range of shad in the rivers is the result of several agencies in addition to the size of the stream, the most important of which are (1) natural falls, (2) insurmountable dams, (3) pollution of the water and (4) extensive fisheries without reasonable limitations.

Natural falls exist at the escarpment line in all the rivers having their sources above the coastal plain, but in only a few instances are they of sufficient height to form insurmountable obstacles to the range of the fish. Most of the streams have been made impassable, however, at, or a short distance above, the escarpment line by means of artificial dams for developing water-power or for navigation improvements.

At quite a number of sittings of the Shad Over-fishing Commission four years ago, the evidence showed that over-fishing had been carried on and numerous catches made, especially in former years, involving not only excessive destruction, but in many cases, an actual waste of fish. Had some restrictions been placed years ago limiting the amount of gear used and guarding against excessive catches of fish, a chief cause of depletion would have been avoided. Such large catches were made that it frequently happened the fishermen could not handle them. In Scott bay, N.S., in 1842, no less than 50,000 shad were taken in a stake seine on one tide. "In 1872-73 a very large catch of shad was taken at Scott bay in three seines, no less than 100,000 shad being captured. In 1884, 55,000 shad were captured in the same apparatus, and in 1897 a catch of 45,000 shad is recorded. Such big catches could not fail to have an extremely harmful and widespread result. Indeed one witness informed the Shad Commissioners that when such big hauls were made 'the shadmen could not

take care of their big catches and had to let some go adrift.' In 1865–68, 3,000 to 4,000 were taken by a seine at a time, but a catch of 8,000 to 10,000 was not unusual, and never more than three or four spawners appear to have been taken at such times during the summer and fall operations. Shad have declined gradually, although there are not so many weirs for shad as there used to be."

Over-fishing must be blamed as a principal cause of decline, and the Dominion Fisheries Inspector on the St. John river, N.B., in his official report to the Department of Marine and Fisheries, 1907-8, likewise laid stress on over-fishing as the cause of scarcity. He reported:

"It is with great regret the fishermen, as well as all classes of our people, find these excellent table fish becoming scarcer from year to year. I think the real explanation is over-fishing, and fishermen along the St. John and Washademoak rivers, at least, realize the necessity for action of some kind at once and are quite willing that greater restriction be placed on the taking of them."

Respecting the decline of the shad on Cornwallis river, Nova Scotia, the following statement from the Commission's Report is specially valuable:

"A stake net 300 or 400 yards long was thrown across False channel below the junction with Shad creek. This was very successful, and for several years the net was added to, then it was moved farther down to Clan creek for two or three years with varying success. Moved to the flats of Canard river north of Starr point, it was enlarged and very successful in its new position. Another company took the old ground on Clan creek with fair success for several years. These nets were fished every tide from the shore by flat punts drawn by a horse. Another seine on a middle ground near the channel of Cornwallis river was also fished by boats. In 1861 the Starrs put in a large stake net on the point of flats between Canard and Cornwallis rivers. It was 10 feet deep and nearly one mile long, and for eight or ten years was very successful. Meantime the other stands began to fail and be abandoned; the Canard fishery declined and other business pressing, the owners sold their rights and nets to another company who have continued the fishery to this day. During this time drift nets took large quantities of shad. The men went out with the tide and returned on the flood. Unquestionably, over-fishing had much to do with the decline."

## SAWDUST AND OTHER POLLUTIONS

The injurious effect of sawdust pollution has long been regarded as of the gravest moment in regard to the shad fisheries. Fifty years ago Dr. Perley called attention to the prevalent pollution of the bay of Fundy rivers by sawdust and mill refuse, and he expressed the view that great harm must result therefrom to the fisheries if this pollution continued. He said:

"There can be no doubt that the large quantities of sawdust and rubbish from the sawmills which have been cast into the harbour of St. John of late years have been highly detrimental to the fisheries and most injurious to the harbour itself. The great floods of the St. John, occasioned by the melting of the snow and ice at the close of winter or by heavy rains at other periods, bring down large quantities of fine silt, rendering the water at those periods extremely turbid. This alluvial matter encounters the sawdust in the harbour and jointly they form a deposit which soon attains much solidity wherever it happens to rest. The western channel into the harbour has shoaled very considerably as well from the deposit of silt and sawdust as the aggregation of slabs and edgings also sunk there."

Quantities of sawdust, before becoming water-logged and later sinking to the bottom, cover the sandy beds and fill the pools on the bay of Fundy flats which the shad frequent. When the sawdust rots, it must, in its decayed condition, be most deadly to all insect life and to the minute food upon which the shad fatten.

# THE REMEDY SUGGESTED

Restrictive Measures vs. Hatcheries Some years ago, when a crisis in the valuable shad fisheries of Canada seemed to have been reached, I stated in an official report that the only practical remedy was the artificial fertilization and

incubation of shad in some of our maritime fish-hatcheries. The Minister of Marine and Fisheries, at the time, desired my recommendations in regard to a suggested protective close season and some restrictive measures in regard to the netting and capture of the fish. I could not recommend any steps in either of these directions, which could be justified. To establish a close season, would, at one blow, destroy the shad fishery in such a river as the St. John, where the fish can only be taken in quantity and in fine marketable condition, as they ascend from the sea for the express purpose of spawning. Nor could regulations restricting the modes of capture be carried out without interfering with other legitimate fishing operations. The large traps or weirs in St. John harbour, for instance, if so worked as not to take shad, would not take gaspereaux and various other fishes of market value. When I first visited and inspected those weirs in June 1893, I found that shad and gaspereaux were being taken in equal numbers with salmon and other fish.

The fishermen laid before me their com-Hatcheries Recommended plaint that the shad were not ascending the river in May and June in numbers at all comparable with those of former years. I felt very strongly that some protection was desirable when the schools of parent shad came in from the sea in May and June in order to ascend to their chief spawning grounds, fifty or sixty miles up the river. The adoption of shad-hatching by artificial means in our hatcheries seemed to me the only feasible course. I favoured it especially for four reasons: (1) abundance of spawn could, as a rule, be secured; (2) the period of hatching is very short, only two and a half to three days; (3) the success of shad culture had been clearly established in the United States, both on the Atlantic and the Pacific coasts; (4) the fish grow quickly and reach maturity rapidly.

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No doubt official reports are not always conclusive, and the bare statement that so many millions of young fry were turned out from a fish-culture establishment in a season may prove nothing. But, when, as in the case of shad hatching on the Pacific coast, waters in which these fish did not exist have become stocked with them, so that, as an important fish-merchant in British Columbia recently told me, they are becoming a drug on the market, it is clear that fish-hatching has had tangible results.

The success of the artificial hatching of salmon and whitefish has been generally recognized in most countries. Canada has almost taken the lead in developing this important work, with far-reaching benefit to the fishing industries of the Dominion. There are no less than forty-two Dominion Government hatcheries now in operation, of which, with the exception of one hatchery at Windsor, Nova Scotia, where experimental work with shad has been tried, nothing has been done by the Dominion Government to increase the supply of this valuable fish by means of modern methods of fish culture.<sup>a</sup>

Supply of Shad Eggs presents peculiar features in regard to its eggs and development, and especially the obtaining of supplies of eggs. These peculiar features necessitate more careful handling than is necessary in the case of such fish as salmon, both in stripping or procuring the eggs, and in the subsequent handling of them in the hatchery. For example, parent salmon, after stripping, are little the worse for the operation and can be liberated into the rivers unharmed, so that the same fish on returning year after year to their own rivers can be repeatedly utilized for hatchery purposes. It is wholly different with the shad. The parent fish, after being stripped, do not, as a rule, survive the operation. Moreover, shad will not bear the

<sup>&</sup>lt;sup>a</sup>See p. 141.

handling which salmon bear with impunity, so that it is impossible to rely at all for the future supply of eggs upon the shad which have once been used for hatchery purposes and then liberated. It is plain, therefore, that every season a shad hatchery must depend for its supply of eggs upon a new incoming school of spawning shad.

The establishment of hatcheries is often Shad Hatching urged as the sole solution of the problem of the shad depletion; but other points must be borne in mind. Thus, when the state of North Carolina, a few years ago, asked the United States Bureau of Fisheries to investigate the decline of the shad fisheries, the Bureau, as a first step, recommended salutary laws. These were adopted by the State and, amongst other things, it was enacted that fishing gear should be confined to prescribed areas and the main channels left clear for the ascent of the fish. Albemarle Sound shad hatchery had been able to obtain only 6.5 millions of eggs, instead of the 75 millions secured five years previously. So beneficial were the restrictive regulations that during the first year of their enforcement the number of shad eggs taken rose to 25.5 millions, and 1908 and 1909 were almost the most successful hatching seasons recorded, the egg collections exceeding 55 millions and 60 millions, respectively.

The hatchery at Windsor, Nova Scotia, requires some mention. It has been successful in the hatching of salmon, as the annual reports of the Department show; but the experimental work with the shad has not, apparently, resulted in such marked success. Various reasons may be adduced for this, but the principal one is that the temperature of the water circulating through the hatchery jars was somewhat high and so hastened development that the resulting fry were not robust enough to ensure completely successful planting.

The most reliable source of supply for shad spawn is the natural spawning grounds, where the fish become active towards evening, and crowd together about twilight on calm nights in late May and early June. At this time they can be seined and the spawn and milt taken by the usual process. More than the usual delicacy in handling and care in collecting must be exercised or the fragile eggs will be damaged. Professors Jordan and Evermann in a popular work, American Food and Game Fishes, speak of the shad's eggs as "very small, semi-buoyant, and usually requiring six to ten days' hatching;" but, while the eggs are very translucent and of extreme delicacy, they are really comparatively large, being, in fact, only one quarter less in diameter than the eggs of the speckled trout. Since the shad is a spring spawning fish, the eggs readily hatch in from three to nine days. It is essential that scales, blood, mucus, and such material be not allowed to fall into the buckets or dishes into which the eggs are spawned. The latter have sufficient buoyancy to dance about in the water if it is only slightly agitated, and in perfectly still water they are barely heavy enough to sink. They appear to be midway between the buoyant floating eggs of marine fishes such as the cod, haddock, and mackerel, and the heavy demersal ova of the herring, salmon, trout, &c. Perfectly clean, fresh water must be used lest particles of mud cling to the slightly cylindrical hatchery jars. The flow of water must be so arranged as to keep the eggs in motion; or they may be placed in flat boxes with small perforations in the bottom and placed at an angle so as to cause a flow of water from the bottom. This current of water should be only sufficiently strong to secure their constant movement and aeration.

The first successful shad-hatching box or floating tray was devised by that pioneer in Western fish culture, the late Seth Green. Mr. Livingston Stone has told us

how, when he visited Green at Holyoke in 1867, he found him attempting the difficult problem of hatching shad eggs. His attempts had been a failure. "The peculiar character of the eggs, and the peculiar treatment required for them had baffled for a time even his keen-sighted genius, and he had indespair almost decided to give it up and return home." He persevered, however, and invented the gauze-covered box. "It was a pleasant thing," Mr. Stone has told us. "to see the change in Green's spirits that came with his first success in hatching shad. It seemed a little thingnothing but some little delicate living embryos appearing in the frail eggs that he was working over." Green perfected an arrangement whereby the box should float "with one end tilted up, so that the current striking the gauze bottom at an angle, is deflected upwards, and makes such a boiling within as keeps the light shad eggs constantly free and buoyed up. The result was a triumph. Out of 10,000 ova placed in this contrivance, all but seven hatched. In spite of delays, and of the imperfect means at hand for taking the fish, Green succeeded in hatching and setting free in the river many millions of these tiny fry." The small wriggling larval shad that bursts out of the egg in 60 to 180 hours, is like all the young of the herring family. indescribably delicate. It is about one-third of an inch long or less than half the length of a salmon just hatched, and has all the frail characteristics of the clupeidae to which the shad belongs.

In taking and handling shad eggs much more care should be exercised than is ordinarily taken with stout and large eggs, such as those of the salmon and the trout. Rough usage at once ruptures them and dirt, blood, mucus and scales, can be with difficulty cleared from them, if allowed to mingle in any way with the ova. Hence wide, shallow vessels must be provided, some of them to be used for spawning the fish into, while into others, partially filled with clean water, the clean eggs, after standing for a while, are gently poured.

The fish require to be taken about twilight just before darkness comes on, as they are then crowding on the shallow spawning beds many miles up the river, though usually not above tide head. The water in which they spawn is purely fresh water, and by hauling a long seine over the beds, sufficient specimens of both sexes may be secured. When captured in the day time, or not on the spawning beds, it is usually the case that all the females and no males are obtained, or *vice versa*.

The eggs are delicate and small (one-seventh or oneeighth of an inch in diameter) and run freely, so that the females must be handled slowly and carefully. If the fish is roughly handled or jerked, they will suddenly be voided, and most, or all, of them lost. The dry method must be adopted, each female being gently pressed and the eggs allowed to stream into a dish that has just previously been rinsed out with clean water. The male is then treated in the same way; but it is frequently nec ssary to kill him, and remove the testes, holding the ripe soft testes in the hand and squeezing the milky fluid over the eggs which are being gently stirred with the finger. Ripe male shad often do not run freely, that is, the milt is frequently retained. On the other hand, when the males are actually on the spawning beds with the other sex, no difficulty is usually found in fertilizing all the eggs. Shad rarely survive artificial spawning and it is useless to return them to the river.

The eggs are so light that, after being washed, they must be transferred to large wide vessels full of clean water, so as to remove surplus milt, blood or other extraneous matter. When thus conveyed in large vessels filled with abundant water, they freely roll and dance about without clogging together. The usual cylindrical glass jars can be used for incubation. It is best to put as small a quantity of eggs as convenient in each jar—fill it possibly one-tenth full—and allow a gentle current to flow. The current will keep them in motion; but, if it is too strong, many eggs will be driven up and escape from the outlet of the jar.

In warm weather shad eggs hatch in two or three days, but it is better to incubate them more slowly and delay the hatching for six or seven days. The delicate wriggling fry require careful and judicious planting on sandy or pebbly flats where the current of the river is not too strong. nature, the eggs are hatched in strong rippling water, but the young fry are soon carried down to gentler shallows. I have repeatedly obtained very young larval shad on fine gravelly or clean sandy shallows below the spawning beds The fish, as already shown, are of rapid of the shad. growth, reaching a length of two or two and a half inches in as many months, and some actually measuring four and a half to five inches in length in their fifth or sixth month. At this stage, they are found in tidal waters, associating with the schools of half-grown herring and moving out to sea.

As I have dealt in detail with the larval development and life-history of the shad in a paper, in "Further Contributions to Canadian Biology, being Studies from the Biological Stations of Canada, Part III", 1902-1905, I need not dwell at further length on this part of the subject.

New Shad Hatchery In accordance with my own recommendations of the Dominion Shad Commission in their interim and their final reports, the Minister of Marine and Fisheries last December, authorized steps to be taken for the construction of a floating shad hatchery which will be operated for the first time this season (1912). This hatchery, which appears somewhat like a lightly built Pullman car, is placed on a

a Pp. 95-110.

scow so that it can be towed from one spawning ground to another. It has a battery of a hundred cylindrical jars and will accommodate from 20,000,000 to 30,000,000 eggs. Water is pumped from the river into an overhead supply-tank  $2\frac{1}{2}$  feet wide,  $2\frac{1}{2}$  feet deep and 5 feet long, and passes by a 3-inch pipe to the glass jars. As the fry hatch out, they pass forward to four receiving tanks of large capacity; from these tanks they are carefully removed to the distributing cans and carried to the places chosen for planting. The hatching room is 36 feet long and about 11 feet in height and has eight windows.

The engine and pump room is 10 feet long, and the living room for the staff is 11 feet long. The scow, 61 feet long, projects about  $2\frac{1}{2}$  feet out of the water. Hence it is suitable for sheltered creeks up rivers, such as the shad selects as its spawning resorts. There the eggs will be secured from the parent shad taken by the up-river fishermen, and will be fertilized and hatched and the fry planted in the adjacent shallow waters.

The initial work of this hatchery will be watched with great interest, and its successful operation will mark an era in the shad fisheries of Canada.

## DISCUSSION: THE SHAD FISHERY OF CANADA

Dr. Jones: The paper you have just heard, gentlemen, is now open for discussion.

Do you know, Mr. White, what were the recommendations of the Shad Commission in reference to the restrictions on fishing?<sup>a</sup>

MR. WHITE: No, I do not. I took it for granted that Professor Prince had covered the whole subject, and neither Mr. Patton nor I made any attempt to procure further information with regard to it.

Dr. Jones: That can be found in the report of the Commission?

a See Appendix VI, page 191.

Mr. White: Yes, and we can include it in the printed report of this meeting.

Dr. Jones: I know that some suggestions of the Commission were not received favourably by the residents along the St. John river. Their objections were so strenuous that it was difficult to induce the Government to enforce the regulations. They depend there upon the shad in spawning time.

MR. WHITE: I judge that what Professor Prince thinks should be done is not only to build these shad hatcheries but that the main channels of the rivers should be left open so as to allow the shad to go up. In British Columbia the salmon fishing is stopped for thirty-six hours. Here is a letter which might be interesting in that connection. It is from New Brunswick and is written presumably by a fisherman.

Editor, Conservation,

Ottawa, Canada

Dear Sir,—

I was very much pleased with an article on the depletion of the shad fisheries of the Maritime Provinces, and thought a few facts, past and present, might be of interest to others. Looking back over some twenty-five or thirty years there has been a great change (for the worse) in these fisheries. At that time a man thought he had very poor success if he did not catch from 25 to 75 large shad in one night, and I know 100 to 150 and even 200 were quite commonly taken by one man with two nets. For many years, this continued under competent and conscientious wardens, but alas, the fisheries fell on evil days and new men were appointed who never left their warm beds to watch the poachers, and it became a common practice for the fishermen in the lower parts of the river to string their nets all across the channels day and night so the fish

could not reach the spawning grounds. To such an extent has this gone on, boldly and flagrantly, that the last ten years has seen such a depletion in the numbers of shad ascending the rivers that, night after night, men toil and watch only to be rewarded with from two and three fish to twelve or fourteen in the best cases; and the law breakers have become so bold, knowing that no warden is likely to surprise them, that we know of cases where wire poultry netting has been employed to turn the fish into the nets.

As a remedy, I would suggest paying enough salary to good men to use every precaution to protect the fish for the future generations, and further, if the fishermen could be compelled to strip the spawn from the shad and floating or permanent hatcheries could be provided, a few years, in my opinion, would see a return to the old order of things, and our waters would again be teeming with an abundance of the most wholesome food for rich and poor.

Trusting I have not taken up too much space in your valuable paper, I am,

Yours truly,

KENNEBECASIS.

Mr. Found: The recommendation of the Shad Fishery Commission practically involved the prohibition of shad catching in the non-tidal portions of rivers for three years. The Commission further recommended that no shad should be caught before the 1st day of July and after the end of August.

DR. MURRAY: After the middle of August?

Mr. Found: Yes, possibly. I am subject to correction on that point. This would practically involve the prohibition of the catching of shad during the time they were running for the spawning grounds and returning from them. Of course, it is realized that the summer or fall shad are in the best condition. These are caught in the

salt water. The Commission also recommended a change in the mesh of the net to be used. The matter was under the consideration of Professor Prince, the Commissioner of Fisheries, at the time, but, owing to the difficulty that was encountered in carrying out the recommendations, it has been decided that we will, first, try the experiment of establishing a shad hatchery.

Dr. Jones: That restriction on fishing for three years is evidently the recommendation that was objected to so

strenuously on the St. John river.

Mr. Found: That was the crux of the recommendations. Dr. Jones: Does any gentleman present desire to discuss this paper further? If not, we shall pass on to the paper on "Fish Culture in Canada" by Mr. Found.



# Fish Culture in Canada

By W. A. FOUND

Superintendent of Fisheries for Canada

R. Chairman and Gentlemen,—The paper that has just been read has dealt to some extent with the subject of fish culture, and it will not be necessary for me to occupy your time for more than a few minutes. What fish culture is, what it can do under favourable conditions, and what has done under such conditions, are so patent to all of us that it is unnecessary for me to dwell upon these points.

Fish breeding in Canada is as old as Confederation. When the British North America Act was passed, there was, at Newcastle, Ontario, a private fish hatchery which was being carried on by the late Samuel Wilmot. It was taken over by the Federal Government and Mr. Wilmot was appointed Superintendent of Fish Culture for Canada. Under his capable management, fish breeding advanced very rapidly considering the conditions then obtaining. In 1880, if I remember rightly, there were eight hatcheries; ten years later there were eighteen; in 1900 the number had increased to twentyeight and, four years later, in 1904, the number was thirtytwo. It had been realized that the immense amount of work involved in supervising these hatcheries scattered throughout Canada made it necessary that a special organization be created if the work were to be done well and the field of operations extended. A fish-breeding branch was therefore established in that year as a part of the Department of Marine and Fisheries. Since then, fish-culture work has been carried on by the branch very energetically.

I think we can point with a considerable amount of pride to what has been done in the way of fish culture in Canada. In the paper which has just been read it was

stated that there were forty-two hatcheries in operation. It would seem that the Report of the Department of Marine and Fisheries of 1910 was referred to when that statement was made. Last year there were forty-nine hatcheries in There were, in addition, two ponds which might, operation. in a sense, have been ranked as hatcheries. One is a bass pond which was established near the bay of Quinte. you know, bass, owing to the nature of the ova, cannot be hatched in the ordinary mechanical hatchery: they are nesting fishes and have to be retained in ponds where they hatch out naturally and where, under favourable conditions, they will increase very rapidly. For instance, in the small pond that we have at the bay of Quinte, the number of parent fish is usually about a hundred and, under favourable conditions, we are able to distribute to the different waters each fall in the vicinity of 5,000. You can see from that what can be done in the rearing of bass in ponds. The other pond to which I referred, is one near St. John, N.B., for retaining parent salmon which are taken from the commercial catch of the fishermen and are held in the pond until they are ripe. The eggs are then sent to the different hatcheries in the Maritime Provinces for incubation. Before the end of this year, the Department will have completed seven additional hatcheries, so that the Committee will see that everything is being done that can reasonably be done, to meet the requirements in the way of fish culture.

We build as many hatcheries each season as it is possible to build and operate satisfactorily. Of course, it is a simple matter to build a hatchery, and the pressure to build one at a place where it will not yield the best results, is sometime unduly great. Unless a sufficient quantity of eggs can be collected each season for the hatchery, its beneficial results will be minimized. Therefore, in each instance where a hatchery is asked for, the Department is endeav-

ouring to assure itself that it will be able, either in the waters in the vicinity of the hatchery or in other more remote waters, to find a supply of eggs to fill the hatchery, and thus build up and develop the fisheries of that and contiguous localities. In this way we are moving as fast as we possibly can, and we hope that the time is not very far distant when we shall have hatcheries established on practically all the waters of the Dominion where commercial fishing is being carried.

I neglected to state, in the first instance, that the Department is practically restricting its operations to the incubation of commercial fishes. The work of rearing game fishes is, of course, a most important one, but the Department has felt all along that, keeping in view the general interest, it must give first consideration to the fisheries in which men expect to make their livelihood and on which the general public rely more and more as an article of food.

The Department hopes that, if no change Culture of Game Fish takes place in jurisdiction, the different provinces will see fit to take up the hatching of game fishes. What the game fisheries are to the different provinces has, in this new country, it seems to me, been little realized. In the state of Maine it is estimated that \$25,000,-000 a year is disbursed by sportsmen visiting the state to fish and hunt. Possibly this estimate includes tourists for other purposes as well, but there is no doubt that in New Brunswick, portions of Nova Scotia and British Columbia and, as far as angling is concerned, in portions of Prince Edward Island, we have conditions which are unexcelled anywhere in the world from a sporting standpoint. But, for the reasons which I have indicated, the Department has not been able to take up to any great extent the hatching of game fish.

I shall be very glad to supply any additional information regarding the different hatcheries that may be desired.

#### DISCUSSION: FISH CULTURE

Dr. Robertson: I would like to ask whether the culture of fish, until they are full grown, not merely in hatcheries, but in artificial ponds, is carried on anywhere in Canada.

MR. FOUND: Yes, that is being done to a certain extent in connection with some of our hatcheries. It is more feasible, of course, in connection with game fishes. The rapidity with which fish eggs are incubated in the commercial hatcheries would make it impossible to retain the fish for

any great length of time.

Dr. Robertson: I was thinking of illustrating the production of fish in limited quantities, say in waters available on farms. Once or twice in Denmark I have seen examples of the profitable culture of fish on a farm in several ponds which are stocked and then emptied. There were perhaps fifteen ponds in a series. When the fish are grown to a certain age or size, a pond is practically emptied and re-stocked with small fish. I have had some enquiries from people in Canada as to whether it would be possible or profitable to engage in that sort of work.

MR. FOUND: That would be as practicable in Canada as it is in Denmark, so far as the raising of the fish is concerned. If it were to be a paying venture, however, you would need greater markets for the fish produced than we have in Canada at the present time. The fish that are grown in ponds in certain parts of the world are such coarse fish as carp which readily reproduce, although speckled trout are grown and sold in a live condition. But, with fish available in the quantities in which they are to be found in Canada at the present time, I am not altogether sure that it would be a paying venture.

MR. WHITE: A resident of Rock Forest, near lake Memphremagog, Que., told me that a man in one of the New England states has a stream connecting four or five ponds.

He puts the smaller fish in the lower pond. In a short time some are decidedly larger than the average and, as the larger fish will eat the smaller, he transfers the larger ones to the next pond. He sorts them out into different sizes, ships those that are of a saleable size to the restaurants and hotels in New York, getting as high as 50 cents a pound for them. My informant stated that this man had found it very profitable. The greatest difficulty he had encountered was in getting the right kind of food for the fish. At one time, he had to import this food from Japan.

Mr. Found: Fish can, of course, be grown and reared in hatchery ponds until they yield eggs.

Whitefish Culture in Lake Superior hatcheries on lake Superior?

MR. WHITE: Why are there no whitefish hatcheries on lake Superior?

Mr. Found: There is a whitefish hatchery on lake Superior at Port Arthur.

MR. PATTON: Is it in operation?

Mr. Found: It is in operation this year. Last year was one of those exceptional years, in so far as whitefish is concerned, in regard to the procuring of eggs. The season kept unduly warm until quite late and the whitefish will not ripen up until the water reaches a certain low temperature. When that time came, storms and extremely cold weather set in suddenly, and, as a result, we were not able to collect sufficient eggs to fill the hatcheries to anywhere near capacity. The pound nets along the shore were broken down. The new hatchery we have completed at Port Arthur is a combined whitefish and salmon trout hatchery, and it ran to its full capacity on salmon trout. The great difficulty we experienced was in obtaining whitefish eggs. During the present year we hope to have this hatchery and one which we are going to establish on Georgian bay, running to their full capacity.

Mr. Patton: What is the average capacity for white-fish of the hatchery on lake Superior and of the hatchery on Georgian bay?

MR. FOUND: Sixty millions.
MR. PATTON: For each?
MR. FOUND: For each.

Mr. White: Do you propose to increase the number of hatcheries on lake Superior?

Mr. Found: Not this year. We want to be quite sure that we shall be able to fill to their full capacity the existing one and the one we are building on Georgian bay.

MR. WHITE: I have always understood that the best spawning grounds on lake Superior were off Caribou island?

Mr. Found: No doubt that is one of the best whitefish areas on lake Superior.

We are now making arrangements with fishermen all over the lakes to have them collect eggs for us and also to have them take fish and hold them for us. We are doing that in addition to our regular collecting in connection with hatcheries. The object is to ascertain the maximum quantity of eggs it will be possible to procure.

Mr. White: Is it true that there are more fish shipped from Caribou island fishing-grounds than any other fishing ground in the lake?

Mr. Found: It is quite likely that is the case. I am not prepared to make a final statement in that regard. The Department has not been administering the fisheries of Ontario since I have been connected with it and I am not so well acquainted with the details of the situation in this province as I am with those in other parts of the Dominion.

Dr. Robertson: Is there any marked difference between the actual quality of the fish in different seasons of the year?

Mr. Found: There is no doubt a difference. No fish is as good at the time of spawning as at other times,

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but whitefish is a wonderfully good fish at practically all seasons of the year.

Dr. Robertson: I do not want to challenge the statement which Mr. Patton made yesterday regarding the excellence of whitefish, because I have some recollections confirming it; but of recent years, my experiences of the excellent flavour of this fish have become rather uncommon. In fact, I have had no experience of it for the last six or eight years. There appears to be a marked deterioration in the quality of the whitefish that we get. I do not know that there is any marked deterioration in the quality of the fish that is caught in the lake, but there is a marked deterioration in the quality of fish offered in the clubs and elsewhere. I wondered if there was any difference in the flavour of the fish at different seasons of the year.

Mr. Found: I should take it that the difficulty is not with the fish when it is taken from the lake.

Dr. Robertson: It deteriorates between that time and the time it is served.

Mr. White: Whitefish are put into cold storage and kept there for a considerable time. The fish caught off Caribou island, lake Superior, are shipped to Chicago and are kept in cold storage for months.

MR. PATTON: On the basis of a plant of 60,000,000 eggs for lake Superior you would plant approximately 1600 whitefish per square mile of area in which that fish is to be found. That is hardly sufficient, is it? The investigations carried on by Mr. Reighard over the whole of the Great lakes established the fact that, to have an appreciable increase in the catch, it was necessary to plant about 20,000 fry per square mile.

Mr. Found: If you look at Mr. Reighard's maps the black areas of which indicate whitefish ground, you will see how comparatively restricted these grounds are in lake Superior as compared with the wonderfully productive

area of lake Erie. But, my answer to that question must be the same as that which I gave a moment ago: while the Department does not wish it to be understood for a moment that it considers it has done all that is necessary on lake Superior to meet the requirements, it wants to be sure that it can fill another hatchery from there or somewhere around there before building it.

Mr. Patton: The whitefish area on the Canadian side of lake Erie is 2,100 square miles while that in lake Superior is 3,600 square miles.

MR. FOUND: Lake Superior is a very big lake, and the conditions there are not, from the standpoint of fisheries, the same as those that exist in lake Erie. Lake Erie is the most wonderful producer of whitefish of all the Great lakes and always has been.

MR. WHITE: The fisherman on lake Erie works under weather conditions that are very much more favourable than those on lake Superior, where he is certain to be prevented by stormy weather, from working for a considerable length of time every summer. Superior is a much more stormy lake than Erie.

Mr. Found: Lake Superior is an extremely deep lake and lake Erie, on the contrary, has a very large area of a depth of water that is considered by scientists as entirely suitable to whitefish. Lake Superior, of course, is a very cold lake and the quality of the fish obtained there is excellent.

MR. COWIE: Is there anything known of the movement of whitefish from shallow to deep water, or do they stay continually in shallow water?

Mr. Found: It seems to be generally accepted that there are well defined movements of whitefish. In the fall of the year they move inshore to the spawning areas, and in lake Erie they move up the Detroit river as well as

other places inshore in very large numbers. In warmer weather in summer, they are out in the deeper waters of the lake.

Mr. Cowie: The fact that lake Superior has a larger area and deeper water should not lessen the quantity of fish found in the lake, provided there were certain patches of shallow water to which the fish might resort.

Mr. Found: If you take soundings of lake Superior you will find that the areas frequented by the whitefish are of limited depth.

MR. WHITE: This is Caribou island (indicating on map) and here is a shoal area which continues from the shore. That, I understand, is the great area for whitefish. All along the north shore of lake Superior it falls off very steeply.

Mr. Found: The catches have always been comparatively small there.

Mr. White: It must be because the shore is steep-to.

Mr. Patton: The depth at which whitefish are found in lake Superior is given as from 10 to 50 fathoms, and this is the greatest depth at which they are found in any of the Great lakes.

Mr. Cowie: Fifty fathoms is quite a fair depth; out on the Grand Banks you find fish at 25 fathoms.

HON. MR. MATHIESON: Possibly they feed on the bottom.

MR. FOUND: Yes, they feed on the bottom.

Dr. Jones: The provinces, at the present time, have done nothing in the line of fish culture?

Mr. Found: Not in so far as I am aware, except that in Ontario I think they have one bass pond.

Dr. Jones: The suggestion was that the provinces might do something in the artificial propagation of game fish.

Mr. Found: Yes, they might in their own interest. They get all the revenue.

Value of Game Fish WHITE: I do not think that the value of the game fish is generally appreciated.

Mr. Found: Quite so.

MR. WHITE: Several years ago, in connection with another matter I had access to figures showing the value of the summer tourist traffic to railways. Prior to that time I was rather under the impression that I had an exaggerated idea of the value of the traffic, but my estimate was about one-third of the actual figures. These figures were as accurate as the railway officials who were in touch with the business, were able to obtain.

Of the \$25,000,000 annually expended in Maine, there is no doubt that a large part comes from the tourist traffic. One tourist comes and is the means of bringing others. The moment you open a hotel, for instance such as that at Cache lake in Algonquin Park, Ont., the place is crowded. You cannot accommodate the people so long as there is any kind of decent fishing. If the fishing is not good, the visitor simply stays over night and goes home again; but if the fishing is good, you can build all the hotels you like and you cannot accommodate the traffic.

At the head-waters of the Madawaska river in Algonquin Park, the Department of Marine and Fisheries put some sea salmon in one of the lakes, and, this spring, six sea salmon, weighing up to 6 pounds each were caught in the Madawaska. It would be impossible for these salmon to go up the river; they could not pass the Calabogie or High falls.

MR. FOUND: In recent years there have been several sea salmon caught in inland waters.

Mr. White: You must be putting them in there.

MR. FOUND: Yes, we are doing a little.

Dr. Robertson: Do they come to maturity in fresh water?

Mr. Found: They come to maturity all right, but the extent to which they propagate is not yet quite clear.

#### RESOLUTIONS

Dr. Jones: Now, we seem to have reached the stage at which we have, to a large extent, exhausted our programme. It will be necessary now for us to review our discussions and consider what action we shall take upon the various matters which have been brought to our attention. I have made a few notes of things which, it seemed to me. require special consideration. The first is in regard to a permanent official to represent the Committee and to carry on investigations from time to time as the Committe may require them. We shall have to consider that matter further and decide for or against the recommendation for the appointment of a permanent official of this kind. I presume the recommendation will go to the Commission if we decide to make one. As far as my judgment is concerned. I think we have an abundance of work for a special officer to do.

Dr. Robertson: What else have you for consideration? Have you a number of other items?

Dr. Jones: Then, there is the suggestion made by Mr. Patton in his paper regarding the extension of the work of culture in connection with whitefish and there is the suggestion made in Professor Stafford's paper regarding demonstration work in connection with oyster culture. We might also remind the provinces of New Brunswick and Nova Scotia of the advantage that Prince Edward Island expects to have in the leasing of ovster bottoms. and suggest that they might take the matter up. The regulations regarding lobsters are also to be considered, especially that with respect to the close season and its more rigid enforcement. Then there are suggestions from Dr. Murray's remarks regarding the better organization of the work of the Department of Marine and Fisheries. There was also the suggestion which I gathered from your remarks yesterday, Dr. Robertson. We might make some recommendation regarding transportation. Finally, we might call the attention of the provinces to the value of game fishes and suggest that they do something towards propagating them.

DR. ROBERTSON: In view of the long list you have, my suggestion would be to take up the matters referred to in the papers and then have the Committee talk over the plans for its future work.

Dr. Jones: That suggestion appeals to me. After doing that we might have a meeting among ourselves.

Dr. Robertson: I would take up those items that grow out of the papers of those who have favoured us with their presence and their advice.

Culture of Whitefish DR. MURRAY: In connection with the paper which was read by Mr. Patton, I have a resolution to propose for the consideration of the Committee:

Whereas the whitefish is recognized as one of the most valuable of Canada's food fishes; and,

Whereas the average annual catch of this fish for the past five years in lake Huron and Georgian bay is approximately one-third the average catch twenty years ago (1886–1890), and in lake Superior, one-half what it was twenty years ago; and,

Whereas no whitefish fry has been planted in lake Superior, and a yearly average of only about 700 per square mile of whitefish area in lake Huron and Georgian bay for the past five years, while in lake Erie and its tributary waters, a yearly average of about 30,000 fry per square mile of whitefish area has been planted during the past five years, and the average whitefish production of that lake for the same period has increased to nearly four times what it was twenty years ago;

THEREFORE be it resolved that this Committee urge upon the Dominion Government the immediate necessity of planting whitefish fry in lake Superior and in lake Huron and Georgian bay in sufficiently large quantities to prevent the depletion of those waters.

Dr. Jones: You have heard the resolution as read by

Dr. Murray.

Dr. Robertson: Would you let me look at it? I would be glad to second its object, but we do not want to pass any sort of reflection on what the Department is already doing. I would suggest urging upon the Dominion Government the necessity of planting whitefish fry in lake Superior, lake Huron and Georgian bay in sufficiently large quantities at the earliest practicable time. They are already moving towards that: they recognize the necessity for doing it and this will be merely a suggestion.

Dr. Murray: Yes.

Dr. Robertson: I will read it:

THEREFORE be it resolved that this Committee urge upon the Dominion Government the necessity of planting whitefish fry in lake Superior and in lake Huron and Georgian bay in sufficiently large quantities at the earliest practicable time to prevent the depletion of those waters.

Dr. Robertson: It is not a very happy wording, but it conveys the meaning. Is that agreeable to you, Dr. Murray?

Dr. Jones: Will you accept that?

Dr. Murray: Perhaps it would be better to insert the words "at the earliest practicable time" after the word "planting".

Dr. Robertson: Yes. We would like to have an expression of our recognition of the work already done by the Department. I want it to appear on the records that we appreciate the work that has already been done; otherwise, some one in Parliament or elsewhere, might use this resolution as the basis of a charge and make it appear that the Department had not done anything at all in the matter. In all the work of this Commission we have sought to co-

operate with every department, rather than to let any department feel that we were somehow seeking to undertake work that it had already undertaken. In so far as we can get any department, the minister in charge of it, and the deputy minister, to perceive that we recognize the good work they are doing, we are all the more likely to accomplish good results. This, perhaps, will cover what we want:

Whereas the whitefish is recognized as one of the most valuable of Canada's food fishes; and,

Whereas the average annual catch of this fish for the past five years in lake Huron and Georgian bay is approximately one-third the average catch twenty years ago (1886-1890), and in lake Superior, one-half what it was twenty years ago; and,

Whereas no whitefish fry has been planted in lake Superior and a yearly average of only about 700 per square mile of whitefish area in lake Huron and Georgian bay for the past five years, while in lake Erie and its tributary waters a yearly average of about 30,000 fry per square mile of whitefish area has been planted during the past five years and the average whitefish production of that lake for the same period has increased to nearly four times what it was twenty years ago;

Therefore be it resolved that this Committee, while recognizing and appreciating the value of what has already been undertaken by the Department of Marine and Fisheries, urge upon the Dominion Government the necessity of planting, at the earliest practicable time, whitefish fry in lake Superior and in lake Huron and Georgian bay in sufficiently large quantities to prevent the depletion of those waters.

DR. MURRAY: Yes.

The resolution was adopted.

Oyster Culture

Dr. Jones: Has anyone any resolution to offer respecting oyster culture or demonstration areas?

Dr. Robertson: I regret that it was my misfortune not to hear the paper of Dr. Stafford, but I would like to say on general principles that I know of no better way, not merely of giving information of economic interest, but of presenting the information in such a way as to induce people to accept it and act upon it, than by the creation of demonstration and illustration areas with proper management and carried on under scientific supervision. I did not hear the details of his recommendation, but I would be glad to support any proposal of that kind.

Dr. Jones: Will you write out something definite in

the way of a resolution, Dr. Stafford?

Dr. Stafford: I have not thought very much about the matter. I simply brought it up for discussion.

Hon. Mr. Mathieson: I suppose you noticed the work that has been done in that regard? Captain Kemp has been doing some extremely valuable work in establishing oyster beds in the waters around Prince Edward Island, New Brunswick and Nova Scotia.

Dr. Stafford: Yes.

HON. MR. MATHIESON: In preparing the resolution, I should think it would be necessary to take note of those facts?

Dr. Stafford: I was with Captain Kemp for three years on the Ostrea.

HON. Mr. MATHIESON: Well then, no person can be expected to have more information than yourself.

Mr. Found: Unfortunately, I was unable to hear a portion of Dr. Stafford's address in which he referred to that subject. Two years ago, the Department took up that very matter of forming an oyster bed on an area near Bird island, Richmond bay, in Prince Edward Island, which had

never before produced oysters, and this spring completed one near Caribou island off Pictou county, Nova Scotia, with the object in view of demonstrating what can be done in the way of the culture and cultivation of oysters on private areas which have not in the past been productive. Of course, the Department's intention is to have this experiment followed up by Captain Kemp, who has been engaged in the work all his life, first in England and now in Canada. It is the intention to have him carefully follow the growth of the oysters on these beds and make the venture a commercial success. I am not aware whether Dr. Stafford had some scientific work on these beds in view at the same time.

DR. MURRAY: When I was speaking yesterday I omitted to mention one thing in regard to the oyster and I subsequently wrote it out for insertion in the report. It is this:

It is suggested that the Department should conduct experimental plots at various places on the coast for purposes of demonstration, and should in this way, and in other ways, provide for the dissemination of information among the people.

HON. MR. MATHIESON: Probably that covers the ground.

Dr. Robertson: Does that include the carrying on of any experimental demonstration in an area never seeded with or occupied by oysters?

DR. MURRAY: Establish experimental plots on ground not at present occupied?

HON. MR. MATHIESON: On barren areas? That is the work that Captain Kemp is supposed to have been doing.

Dr. Robertson: I think your resolution should cover both to meet the whole situation.

HON. MR. MATHIESON: There are two points to be considered; first, what can be done with barren areas; second,

what can be done toward improving methods of cultivation on live areas. Areas that are now alive and those that are planted and have, or will, become productive areas would have to be considered under the latter head.

In the case of our experimental farms, we do not take into sufficient account whether the methods employed are practical or not. In the case of oyster-culture experiments we should be much more exacting in this respect. We should not be satisfied with experiments until they have reached the stage where they show that a profit can be made. We might find that oyster spat could be gathered by some method so expensive as to put its adoption out of consideration altogether. Or, in laying out the beds, we might assemble material which would cost so much as to put it out of the field of practical use.

Dr. Stafford: What my suggestion chiefly had reference to was the deciding of the proper time to put out the cultch. Captain Kemp has been carrying on work for, I suppose, twenty years in Shediac bay and also, for a considerable time, at Tracadie, Nova Scotia. He began with areas that were pretty largely natural beds. His work consists chiefly in clearing out the eel grass and shaking down the silt that covers the areas so that the oysters will not be smothered, and in levelling over the ground and dredging the old oyster shells so as to provide a larger area for the capture of oyster spat.

In the new areas that were referred to, one near Bird island in Richmond bay, and one off Caribou island, near Pictou, the idea is to create a new oyster bed where there was none before. In doing that it is necessary to make a sufficiently solid substratum to support the cultch. If it were a muddy place, there would have to be a considerable quantity of cultch thrown in before the upper layers of the cultch would be above the mud. A substratum is prepared and then cultch is thrown on this as near as possible to the

time when larvæ are to be found in the water full-grown and ready to settle down as young spat. Besides that you have to prepare larvæ by putting on the area spawning oysters, or what you suppose are oysters that are going to spawn very soon, so that their developing young will be there ready to attach to the cultch.

After having the bed prepared and the Oyster Larvæ spawning oysters placed, it is necessary to determine approximately when the developing larvæ from these spawning ovsters will be ready to settle down as spat. That is the point where my investigations are of great importance. If the cultch intended to catch the full-grown larvæ is put out a week or two weeks before it should be, it will be very slippery, or covered with sediment, or otherwise damaged, and perhaps you would not catch more than one in one hundred or one in one thousand of what you should catch. My method is to decide when there are the most full-grown larvæ in the water ready to settle as spat. They cannot swim continuously after they reach a certain point, and they have to settle. I can determine when large numbers are ready to settle. There may be a great number of others that are growing up that will not be ready to settle for a week or perhaps longer, but the point is to decide when the greatest number of all the larvæ that are in the water will be ready to settle as spat. That is the time to put out the cultch perfectly fresh, so that it will be there when these full-grown larvæ are settling as spat. It is the time when you will catch the greatest number. This is an entirely new method that has not been used in Europe, the United States or anywhere else; in fact, it could not be used because it had not been determined until, as I told you yesterday, I had traced the life history of the oyster for three weeks longer than it had been known before. Nobody previously suspected that it was living as a larva for that three weeks.

Hon. Mr. Mathieson: What indicates that spatting is going on? Can you tell by the appearance of the water? Dr. Stafford: No.

HON. MR. MATHIESON: What is the means of ascertaining the beginning of spatting? What is the first indication?

Dr. Stafford: You must examine the shells, stones or other objects in the water until you find little spat.

Hon. Mr. Mathieson: What appearance do they have when you first detect them?

Dr. Stafford: Here are a few young spat (exhibiting specimens in phial). What the oyster fishermen call spat are small oysters perhaps an inch or an inch and a half in diameter. I have here a few specimens from one millimeter in diameter up to nearly six millimeters in diameter. The oyster fishermen would never see these. Captain Kemp does not deal with these in his work. He deals, as the oyster fishermen do, with oysters on practical beds such as exist at Whitstable in England.

Mr. Cowie: What are these? (referring to specimens exhibited)

Dr. Stafford: These are spat.

Dr. Jones: Ready to attach themselves?

Dr. Stafford: They are attached. These were scraped off shells.

Hon. Mr. Mathieson: I regard this as a most important point. About what season of the year is the spat ready to settle?

Dr. Stafford: About the middle of August the larvæ begin to settle and become young spat.

Dr. Robertson moved the following resolution:

RESOLVED that further research work and demonstration work in oyster culture, more particularly that outlined in the addresses of Dr. Stafford and Dr. Howard Murray, be commended to the favourable attention of the Department of Marine and Fisheries for such action as may be practicable.

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The intention is to have the Department do something which I think we are perhaps not ready to undertake for want of staff and other reasons. My thought was to cover in these two phrases "research work" and "demonstration work," which include the economic aspects, the application of scientific methods to the conditions in such a way as to show that a profit can be made. There might be research work which would involve the expenditure of a good deal of money without very much demonstration, but demonstration applied to the conditions is demonstration work under practical conditions. I shall put the motion on the table in order that it may be improved by others.

Mr. Cowie: How is this going to affect the arrangement Premier Mathieson talked of yesterday?

HON. MR. MATHIESON: There would be no conflict at all in that regard. We would be delighted to have the Dominion co-operate in the work of development.

Mr. Cowie: You are undertaking development work of your own?

Oyster-Planting Operations Hon. Mr. Mathieson: Yes, except with live beds. The beds that are now alive will still be open to the public and dealt with as before, subject only to such changes in the regulations as may adapt them more completely to the dual system of private and public ownership.

I would like very much if we could, in dealing with this matter, get down to something a little more specific. I am afraid our resolution would not give very much information to the Department. Perhaps Dr. Stafford could tell us what success has been met with in those experiments in planting beds by Captain Kemp. My knowledge about that is very limited, but I know of some places where beds have been planted, and I do not know of any that have proved successful. The cause of failure may have been lack

of proper protection, but I have in mind three different places where beds were planted and in which there does not appear to be any evidences of success.

Dr. Stafford: I know the bed at Shediac pretty well. Captain Kemp had been doing work on that for eighteen years when I was with him. had the Ostrea at my service for all of one summer on the east coast of New Brunswick and around Prince Edward Island. The summer when I happened to be working there came after the Dominion elections in the previous autumn, and for two weeks, beginning just before and continuing just after the elections, the reserve at Shediac had been thrown open to oyster fishing. Fishermen, farmers and everybody with all kinds of boats came from every direction within a radius of twenty miles. There were so many that on the first day they took more than half of the number of oysters caught in the whole time. Then the number of fishermen began to dwindle, the work was continued for about eight days, when the oysters became so few that it was not worth while to stay any longer.

That was in the autumn. I was on the ground next summer and Captain Kemp and I took four dredgefuls of oyster shells up without finding a single living oyster among them. I went to several other places around the coast of Prince Edward Island and at Baie du Vin I distinctly recollect that in the first dredgeful—which we hauled exactly as in the same way as at Shediac—there were seventy-two living oysters as compared with none at all in four dredgefuls at Shediac. You can thus see the effects of excessive fishing. These Shediac beds were in good condition before that onset upon them. Captain Kemp's work for eighteen years was practically nullified by this excessive fishing for eight days.

HON. MR. MATHIESON: That might account for the failure of those beds that I had in mind.

Dr. Stafford: Those that you have in mind were not so well selected, as far as physical conditions were concerned. The water may have been too deep, or they may not have had a properly prepared bottom, or there may have been some other cause. There are a great number of physical conditions that have to be considered. Captain Kemp has had experience of this in England and he has devoted his attention to the formation of the beds here on the most suitable ground.

The work that I referred to is distinct from that. It does not clash with Captain Kemp's at all. In fact, Captain Kemp's and my own work would go best together, one supplementing the other. Captain Kemp's does not deal with the oyster in its microscopic condition. He begins with the oyster after it is already so large that the oyster fishermen would recognize it as an oyster. My work deals with its development from the egg up to that point.

MR. PATTON: I understand the practical point of Dr. Stafford's paper to be that the fishermen should be instructed how to determine just when the larvæ are ready to attach themselves to the cultch.

Dr. Jones: I have written out a resolution which I will read:

RESOLVED that the Dominion Department of Marine and Fisheries be urged to carry on demonstration and research work looking towards improved methods of oyster culture, especially with reference to the proper time of putting out cultch in order to procure the necessary supply of spat, and also to carry on further demonstration work in connection with the formation of oyster beds in grounds not now productive of oysters and to assist in the introduction of improved methods in live oyster beds.

HON. MR. MATHIESON: I think that expresses what we want.

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Dr. Stafford: I think that incorporates our ideas fairly well. In regard to the other resolution, I think it a mistake to put research first. I have done enough research to start demonstration. The point is to prove that there is a possibility of making a demonstration to the fishermen to show that my method of determining when the larvæ settle is on an economic basis. My work has covered this point, but it would have to be so adapted to conditions as to satisfy the fisherman.

Dr. Robertson: I will be glad to withdraw my motion in favour of it.

DR. STAFFORD: I think that, after making a demonstration, there may be unforeseen conditions that will crop up causing the operator to modify his mode of procedure somewhat. That is where the research comes in afterwards. The research up to the present time is sufficient in so far as we can see. But when we get to the oyster beds we might find further research necessary.

Mr. Found: You mean to put the practical work first and the research work afterwards?

Dr. Stafford: Yes, the practical work first and the research work afterwards.

Dr. Robertson: I think Dr. Jones' resolution expresses that idea.

Dr. Jones: My idea is to conduct the research work that Dr. Stafford has in mind and also to carry on further demonstration work in the case of non-productive oyster areas and the planting of oysters.

Dr. Robertson: Put in the word "further" before "demonstration and research."

Dr. Jones: "Further demonstration and research work"?

Dr. Stafford: Yes.

Dr. Robertson: Is that what you want, Dr. Stafford?

Dr. Stafford: I am not sure that the word "further" is necessary, because I do not think there has been any demonstration work done.

HON. MR. MATHIESON: There has been demonstration work merely in the matter of the planting of these beds; but that does not cover the special demonstration that is being dealt with here, viz., instructing the fishermen as to the indications of the existence of larvæ and the time when they will become attached.

What is the first indication you have of the existence of spat?

Dr. Stafford: The first indication is the presence of spat.

HON. MR. MATHIESON: In what form, in what location? Is it floating or set?

Development of the Oyster Egg lies quies-cent for five hours after being spawned.

HON. MR. MATHIESON: On the bed?

DR. STAFFORD: Yes, dropping through the water or lying on the bottom. Then, it becomes capable of swimming. It is not proper to call it an egg any longer; you call it a larva then. It begins to swim back and forward, wandering around, but it does not range over any great distance. It continues thus for three weeks and grows large, about a hundred and twenty-five times the volume with which it began.

Hon. Mr. Mathieson: Can you detect it swimming

with the naked eye?

DR. STAFFORD: No, you cannot see it; it is invisible in the water. It is about one-third of a millimeter, perhaps, about one seventy-fifth part of an inch in diameter. It lives for about three weeks in the free-swimming stage which is called a larva. Then it grows too heavy to continue swimming with its swimming organ, and it sinks to the bottom. Then, it can creep for a short time by means of a foot. That foot was never found on the oyster till I discovered it in 1904 at Malpeque. First, it has a swimming organ and later it has a creeping organ. Then, when it finds a proper

place for fastening, it falls over on the left side and fastens the left shell to a shell or a stone or whatever suitable substance it falls upon.

Hon. Mr. Mathieson: By a secretion of its own?

Dr. Stafford: By a secretion of its own. This done, it remains fixed. This is the spat. At first it is not any bigger than the free-swimming larva, and it is not visible to the naked eye. One cannot see it unless one has been trained to see it by the use of a lens. That is the youngest stage of the spat. Those that I was showing you (referring again to specimens) are larger than that, and the spat that the fisherman would recognize are very much larger than that. They might be as big as a quarter of a dollar before the fishermen would recognize them as oysters.

Dr. Robertson: Would they become oysters without attaching themselves?

DR. STAFFORD: No, they cannot continue to live in a free state. The oysters we find free on the beds are oysters that have been broken loose by some cause—by storms, or by some other means. If they get to be big oysters, and are broken away from the rock or another oyster shell, they can lie on the bottom or tumble around and continue to live, provided they do not fall into soft mud and get covered up.

Dr. Robertson: The oyster is covered with a shell?

Dr. Stafford: Yes, the shell begins when the swimming period begins and grows larger and larger until it is large enough to enclose the whole animal. The animal can partly protrude itself out of the shell and then draw itself back again.

Hon. Mr. Mathieson: Is this foot you speak of similar to the clam's foot?

Dr. Stafford: A good deal like the clam's foot. Dr. Robertson: The foot entirely disappears?

DR. STAFFORD: The foot disappears in a few days after the larva becomes a spat. In the first day the foot so far disappears that it is hardly recognizable. I have a series of sections of the largest larvæ so that I can study them under the microscope. I have sections of the largest larvæ and the youngest spat at different stages up to an inch and a quarter in length, so that I not only know the development of these externally, but I know their anatomy from the earliest stages up.

HON. MR. MATHIESON: At what stage would you consider that the oyster could, without disadvantage, be separated from its attachment? They seem to require to be attached at a certain stage for the preservation of their life.

Dr. Stafford: Yes.

HON. MR. MATHIESON: What is it that changes that condition and makes it advantageous to set them free?

DR. STAFFORD: It is not advantageous to set them free. It is only in accidental cases that they are set free. If you go out on the point of Ram island in Richmond bay, you will find a great number of little oysters about an inch and a half to two inches and a half in diameter, that are free. These are the little oysters that are picked up and shipped away for planting in other places. They are collected by the Indians, principally from Richmond bay, and are used for planting on the beds near Bideford. Those that are free have been broken off by storms, rolling stones, shells, the solvent action of water and, when the tide is out, the action of the weather in loosening the solder that holds them fast. The natural thing is for them to remain fixed on the rocks or on shells that are fast to one another. At Ram Island point you can hardly put down your foot without tramping on oysters. Where they are so numerous, it is not surprising that a good many may have become loosened from one cause or another; but, if they are loosened, it is accidental. The natural thing is for the oyster to remain fixed as long as it lives.

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MR. FOUND: If a shell becomes so covered with spat that the oysters could not grow up, would the storms not knock some of these young oysters off?

Dr. Stafford: As the young oysters attached to a large shell covered with spat, become larger, they would grow against each other. That is what modifies the shape of some oysters, causing them to grow long or twisted. If that happens the oyster culturist breaks the old shell so as to make more room. Little oyster spat, when they are first formed, are attached to small shells like that of the periwinkle; but when the oyster grows larger the periwinkle comes to be the small thing attached to a large oyster, whereas, at first, the oyster was a very small speck on the periwinkle. In such a case the oyster becomes free when it grows up, although, when small, it was fixed to the periwinkle.

Dr. Robertson: Is there any difference in the rate of growth between free and fixed oysters?

DR. STAFFORD: No, provided the free ones are on a good, solid substratum of rocky bottom or hard sand, and provided they are turned right side up. The natural position of the oyster is to have the left side down and the right side up. The two shells are unequal in size. The object of this is to allow the larger shell to lie against the substratum, and the openings between the margins of the shells are then nearer the upper surface, allowing the oyster to get clear water without drawing in sand or mud. If you turn the shell over so that the other valve is next the substratum, the probability is, if the latter is mud or sand, that the opening will be closed up so that the oyster cannot get its supply of water or food.

HON. MR. MATHIESON: Then I suppose the oyster dies of suffocation.

Dr. Stafford: Yes.

Hon. Mr. Mathleson: The object of attaching seems to be to prevent the oyster sinking into a soft bottom and

choking by stoppage of circulation?

DR. STAFFORD: Yes. There was a time when the oyster, the same as most of the molluses, remained free. That is shown by the presence of the foot yet to be seen in the young oyster. The oyster became changed at some period in the life of the world, and now it fastens itself to the substratum. When it once became fastened, it was no longer necessary to have the creeping foot. It may have crept about for several thousands of years so far as we know, but the foot has largely disappeared. It still persists in using it at one stage of its development. Now, the oyster has adopted a different method of life from that of the clam or molluse.

HON. MR. MATHIESON: The observation that the oyster attaches itself in order to prevent itself sinking into soft bottom and the consequent stoppage of circulation, is of great practical value.

DR. STAFFORD: Yes.

HON. MR. MATHIESON: If you set it free you must give it a free circulation of water, the condition that it sought by fastening?

Dr. Stafford: Yes.

HON. MR. MATHIESON: That fact should be taken into account in the proper construction of every oyster bed?

Dr. Stafford: Yes.

HON. MR. MATHIESON: I have seen oysters in the estuaries of tidal rivers when at or near high tide. They are called rock oysters, but I suppose they are just the same as the others?

Dr. Stafford: Just the same as the others.

HON. MR. MATHIESON: Time and again I have seen great numbers of these oysters far above low-tide level along the banks of the West river, one of the rivers that

flows into Charlottetown harbour. They could be seen closing up their shells when the tide was out and opening them up again when the tide came in.

Mr. Cowie: One of the secrets of successful oyster culture would be preventing mortality by breaking up those shells, bricks or stones where clusters of oysters or spat are assembled together?

DR. STAFFORD: Yes; that is practically what the oyster culturist has to do. Oyster culture on the eastern coast of the United States begins with the oysters already developed to an inch or two in size. They call that seed and they buy it from people who develop it. The oyster culturist buys the seed, puts it out on his beds, waits till it grows into marketable oysters and then sells them. The ordinary oyster culturists do not begin with the egg, the larva, or the young spat. My method would begin with the larva at the time that it was most abundant.

From the first development of the eggs to the end of the process of development, oysters are subject to all kinds of dangers. One oyster lays, say sixteen million eggs, and the fact that the number of oysters in one year is about the same as the number of oysters in the previous year, shows that out of sixteen million eggs, one is brought to maturity as an oyster. That shows the great mortality, and it shows the magnitude of the forces that are warring upon the oysters. The method I propose is to begin far back, as close to the egg as possible in the development of the oyster, and keep the process of development under the control of man so that he can protect the oyster from those destroying forces.

HON. MR. MATHIESON: What would you suggest as the best indication of the production of spat? You have spoken of the earliest indication that one can see. Where can one find these indications? Supposing I were anxious to know whether the spatting season was on or not, where could I go to search?

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Mr. Stafford: Go to the oyster beds and examine the shells there.

HON. MR. MATHIESON: Fish them up?

Dr. Stafford: Fish them up and look them over.

HON. MR. MATHIESON: Is there any material I could put into the water that would give me any indication of the presence of spat?

DR. STAFFORD: You could put in oyster shells that you had exposed to the sun and dried off, stones, crockery ware, broken bricks, glass, or almost anything.

HON. MR. MATHIESON: What about the branches of trees?

DR. STAFFORD: The branches of trees are good, but they are not so good as the other materials. They become coated more easily with slimy matter. I have used stakes and branches of trees tied in bundles.

HON. MR. MATHIESON: You would rather have solid materials such as you mentioned—shells, tiles or bricks?

Dr. Stafford: Yes, shells.

Dr. Jones put the resolution.

Hon. Mr. Mathieson: I second that. I think it meets the requirements very well and it is as specific as you can make it.

The resolution was adopted.

Conservation of the Lobster Dr. Jones: Regarding the close season for lobsters, I thought, from some remarks of Premier Mathieson yesterday, that he might wish to have a motion passed on that subject. I am not urging any of these points, but they are matters which occur to me as probably requiring some attention.

Hon. Mr. Mathieson: I had rather a vague idea of the nature of the work of this Committee when I came. I would hesitate at this meeting to be responsible for a resolution which would embody the views that I consider

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to be generally held in the Province. I would like to have a little more authority before taking that responsibility. The resolution as to oyster culture is one that is absolutely safe: it does not impose any check. But my own idea with respect to the lobster fishery—and I have practically no doubt that it is one that is held generally throughout Prince Edward Island—is that the only effective regulation is that having to do with the length of the season, that any other regulation will involve so much evasion and call for the appointment of such a staff of officials as to be impracticable. Even with an increased staff, it would be so generally evaded that it would have to be speedily changed. regulation fixing the length of the season can be enforced. No man can pack lobsters without having a place on the shore where he has his fires and apparatus for carrying on the canning. He cannot hide himself any more than an illicit still can be hid. The consensus of opinion is that the only regulation that should be enforced is that regarding the length of the season. If such a regulation is put into effect, the industry will take care of itself.

Dr. Jones: Perhaps it would not be advisable to pass any resolution at this stage.

Hon. Mr. Mathieson: I would not care to propose one. I would rather have more authority before doing so.

DR. Jones: Dr. Robertson, have you put in writing your idea respecting the transportation question that you spoke of yesterday afternoon?

DR. ROBERTSON: I would not like to move any resolution. The problem is one that an expert might be set to work upon. He might look into the question and report such information as he is able to obtain at the annual meeting.

Handling of Fresh Fish

MR. Cowie: I think that would be the most sensible thing to do, because railway transportation, with the assistance that is being given as

explained by Mr. Found, is more than sufficient in the meantime. What you need to enquire into, in my opinion, is the handling of fish by the fishermen, with the idea of getting them to bring them ashore in a perfectly fresh condition and getting the fish merchants who buy from them to send nothing but fresh fish to inland points. The transportation question, I think, is met in so far as it can possibly be met, by the present arrangement. The solution of the whole question lies in finding out how the fishermen can be made to bring perfectly fresh fish to land, and getting the fish merchant to send only the finest and freshest fish to the fresh-fish markets. At the present time they do not send fresh fish. I find fish that are perfectly white in the gills being exposed as fresh fish. Such fish should not be eaten. The transportation question in my opinion, does not need to be investigated at the present time; it is more an improvement in the methods of handling and marketing the fish that is required.

Hon. Mr. Mathieson: Except from the fisherman to

the railway or steamboat.

Mr. Cowie: Yes, perhaps they have no railway right at hand and that difficulty may need some attention.

DR. Jones: Shall we offer the provinces any advice regarding the culture of game fish? We are an advisory body and we are supposed to give advice.

Hon. Mr. Mathieson: They will not take it.

DR. MURRAY: I should like to bring forward for the consideration of the Committee a resolution with regard to the education of the fishermen in methods of preparing fish for market.

DR. ROBERTSON: I would like to express my sympathy with the object of such a resolution and to support the idea; but I would not like to second it, being Chairman of the Commission on Technical Training and Industrial Education.

If the information that Dr. Stafford gave us this morning could be put into such popular form that the ordinary man who has an oyster bed could understand its meaning, it would be most valuable.

HON. MR. MATHIESON: I think there is no doubt that Dr. Stafford has made a most valuable contribution to the information we have hitherto possessed on oyster culture. That extension backward into the region of the oysters' origin ought to help us very much. A pamphlet on the methods of detecting the presence of spat from the earliest indications up to the final procuring and disposition of it would be read with great care and carefully preserved.

Dr. Jones: Mr. White assures me that the proceedings of the Committe will be published as one of the publications of the Commission of Conservation. Might we not get Dr. Stafford to write such a popular article as you have in mind so that we might include it in the report of this Committee?

Hon. Mr. Mathieson: Yes, if he would.

Dr. Jones: If he would, I am sure that the officials of the Commission could arrange the terms satisfactorily.

HON. MR. MATHIESON: So that it might go out as a pamphlet.

Dr. Stafford: You mean an article to educate the ordinary fisherman on that point?

Dr. Jones: An article giving in popular form the information which you have given to the Committee.

Dr. Stafford: I have made references to it in several works and I am writing a new work which is the sum of all my previous works and in which I put the results of my observations together in a more systematic and orderly form than they have hitherto been published. I would like to test all my applications on a large scale and satisfy myself before I begin to educate the fishermen, because, in testing them, I might discard some parts of the process that would lead others astray if they undertook to make use of it.

Hon. Mr. Mathieson: August was about the time you said we might look for the spat, was it not?

Dr. Stafford: On our coast, on account of the colder weather, oysters do not spawn as early as they do on the warmer eastern coasts of the United States. From the time the ovster spawns, that is, throws out its eggs, until the spat develops from that spawn, a period of about three weeks or a month elapses. I reckon it is a month in our northern waters and perhaps three weeks farther south. The time of development from the egg to the first swimming stage is only about five hours. If these oysters spawn about the first of July, the spatting will take place about the first of August. In the two years I have devoted to this point, I have recognized spat about the middle of August. I think that there may have been a few a little earlier than that, but they are hard to find. About the middle of August they become sufficiently numerous to be detected if you examine a considerable number of shells. All of the freeswimming larvae will be settling down as spat by the end of August. By the first of September there are very few freeswimming larvæ in the water. When using the plankton net you do not find many free-swimming larvæ at that time.

HON. MR. MATHIESON: Some fishermen have the idea that certain seasons are much more favourable to the production of spat than others. They think that a warm, dry summer is favourable and that the long continuance of cold rain is injurious.

DR. STAFFORD: Yes. In the summer I spent on the eastern coast of New Brunswick three years ago, the season was three weeks behind what it was during the summer I spent at Malpeque. This was owing to the difference in temperature.

Dr. Jones: The resolution suggested by Dr. Murray is before the Committee.

HON. MR. MATHIESON: I am prepared to second it. I was just wondering as to the mode in which the object proposed by the resolution could be effected. After all, the fishermen will sell the fish to the merchant if the latter will take it from him. The exporter is the man who has to sit in judgment upon the quality.

Dr. Murray: I think it could be done by means of an

inspector.

Mr. Cowie: You are referring to pickled fish in your resolution. I think Dr. Robertson proposed to deal with the transportation and handling of fresh fish. Am I right in understanding that you are referring to pickled fish?

Dr. Murray: Yes.

Mr. Cowie: I think that would be fully covered by the measures proposed to be taken by the Department.

Dr. Murray: Well, that will be quite satisfactory.

Dr. Jones: Then you think a resolution will not be necessary?

Dr. Murray: Do you propose the standardization of pickled fish and the appointment of inspectors?

Mr. Cowie: The whole question will be thought out in detail.

The proposed resolution was withdrawn.

Dr. Jones: Is there any other matter that should be covered by resolution?

Dr. Murray: Would it be in order for us to make a recommendation in regard to the reorganization of the service?

Hon. Mr. Mathieson: In the line of your proposal yesterday?

Dr. Murray: Yes; perhaps we might make a recommendation in regard to the creation of a fisheries agency in Nova Scotia.

Hon. Mr. Mathieson: I would like to move:

RESOLVED that the Committee records its appreciation of the value of the papers and addresses presented by the experts who have so favoured it, and hereby tenders to them its hearty thanks for the services thereby rendered to the Committee.

Dr. Robertson: I have much pleasure in seconding that resolution.

Dr. Jones: I think it is scarcely necessary to put a motion of that kind, except to have it on record in the report of our meeting as expressing our thanks, because I am sure that these gentlemen appreciate the fact that we are deeply grateful to them for the assistance they have given us. Our meeting would scarcely have been a success without the advice they have offered us and the suggestions they have made.

The resolution was approved.

Dr. Jones: I have great pleasure in tendering to these gentlemen our thanks for the very valuable assistance they have rendered us.

MR. FOUND: I would like to say, on behalf of myself and my colleague, Mr. Cowie, that it has afforded us great pleasure to be here and that we have derived very great benefit from hearing the papers that have been read and the remarks and suggestions which have been made.

Fisheries Statistics PREMIER MATHIESON moved, seconded by DR. HOWARD MURRAY:

RESOLVED that the Committee express its approval of the action of the Department of Marine and Fisheries in endeavouring to secure more accurate fisheries statistics; and further,

BE IT RESOLVED that the Department be requested to publish each year in its Annual Report a statement, in readily available tabular form, of the number of fry of various kinds of fish deposited by it in each stream and body of water where such are planted in Canada.

The resolution was approved.

Dr. Jones: Is there any further resolution?

Provincial Fisheries Agency DR. MURRAY: I should like to propose another resolution:

RESOLVED that this Committee approves the proposal for the establishment of a fisheries agency in Nova Scotia similar to the Marine Agency.

That is not exactly recommending it, but yet it brings it to the attention of the Department.

Dr. Jones: Is this resolution seconded?

Dr. Murray: If it were found to be an improvement over the present system, it might be adopted in the other provinces later.

HON. MR. MATHIESON: I do not quite understand the distinction. There is a Provincial Marine Agency in Nova Scotia?

DR. MURRAY: Yes.

HON. MR. MATHIESON: Does not the agent act also for the Fisheries Department?

DR. MURRAY: I am not sufficiently acquainted with the situation to be able to answer that very definitely. Perhaps Mr. Found could give us some information on that point?

Hon. Mr. Mathieson: I do not understand it myself.

Mr. Found: I do not know that I can give the Committee a very clear conception of the Marine Agencies, because, after all, the records of the Marine and the Fisheries branches are as distinct as are those of other departments of the Government. Infractions of the Fisheries Act, the expenditure of a good deal of money and the local business incident to the Marine branch of the Department would come under the charge of the Agency. I cannot speak at the present time in regard to the question of reorganization for the reason I gave yesterday, that the matter is under the Minister's consideration; but I may say that he realizes with

all clearness that the conditions are not satisfactory and the system needs to be completely reorganized. Until he is in a position to consider the matter, I cannot express any opinion one way or the other as to what may be the best means of meeting the requirements.

Dr. Jones: Perhaps it might be wise to let these matters remain over until January, when we could have a meeting in connection with the general meeting of the Commission.

Dr. Murray: Perhaps it may be settled at that time to the satisfaction of all people concerned.

Mr. Found: I have at least the hope that when the reorganization has been considered it will meet all requirements.

DR. MURRAY: Well, I will not press the matter at the present time. I think it might very well rest until the annual meeting.

HON. MR. MATHIESON: Your proposal, in any event, will be published in the report of this meeting.

The resolution was withdrawn.

Fur-Farming Investigation It was moved by Dr. J. W. Robertson, seconded by Dr. Howard Murray,—

That the Committee approves the action taken to prepare a bulletin on fur-farming in Canada.

The resolution was approved, and the meeting then adjourned.

Appointment of an Expert Committee, the appointment of an expert on fisheries, game and fur-bearing animals was thoroughly discussed and the following resolution moved by Premier Mathieson and seconded by Dr. J. W. Robertson, was passed:

RESOLVED that this Committee considers it necessary that an expert official be appointed to the staff of the Com-

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mission of Conservation to carry on investigations and report upon all matters respecting fisheries, game and furbearing animals.

The committee then adjourned sine die.



### **APPENDICES**

### APPENDIX I

#### PROVINCIAL LEASES TO OYSTER BEDS

CHAP. 23, 2 GEORGE V

### AN ACT TO AMEND THE FISHERIES ACT

Assented to 1st April, 1912

HIS MAJESTY, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

1. The Fisheries Act, chapter 45 of the Revised Statutes, 1906, is amended by inserting the following section immediately after section 67:—

"67a. The Governor in Council may, upon such terms and conditions as are agreed upon, authorize the government of any province to grant leases of such areas of the sea coast, bays, inlets, harbours, creeks, rivers and estuaries of such province as the government of such province considers suitable for the cultivation and production of oysters, and any persons to whom such leases are granted by such province shall, subject to the fishery regulations of Canada, have the exclusive right to the oysters produced or found on the beds within the limits of their respective leases; provided that, in the event of such areas, or any part thereof, being in a public harbour, nothing in this section shall prejudice the right or title of the Dominion to the enjoyment and use of such harbour for every purpose other than the cultivation and production of oysters."

### APPENDIX II

# PROPOSED MODUS VIVENDI TO PERMIT OF THE GRANTING OF LEASES FOR OYSTER CULTURE

A GREEMENT, between the Government of the Dominion of Canada and the Governments of the Provinces of Nova Scotia and New Brunswick, respecting the leasing of portions of the coast of the several Provinces to private persons for oyster culture.

For the purpose of building up an industry in oyster culture and cultivation in the said Provinces and pending the final settlement of the ownership of the coasts and territorial waters of Canada, it has been and is hereby agreed as follows:—

1. The Minister of Marine and Fisheries of Canada for the time being may grant leases to private individuals and companies of such areas of the sea coast, bays and rivers of the said Provinces as he may consider suitable for oyster culture and may under such leases, grant the exclusive right of fishing to the lessees, as well as any other rights or privileges by him considered necessary for the culture, cultivation and protection of oysters; but the power so conferred on the said Minister shall not, except for the purposes of this agreement, be construed as in any way recognizing the right of the Dominion of Canada to any interest in the fisheries or in the lands subject to lease for the purposes aforesaid.

No such lease shall, however, be granted for natural producing oyster beds, which shall remain open to public fishing as in the past.

- 2. Leases issued hereunder shall be in the form of schedule "A" to this agreement, and no substantial variation shall be made in the form of lease without the consent of the Government of the Province interested. No lease shall be cancelled whether for nonpayment of rent or otherwise without the consent of the Government of the Province within which the area leased is situate.
- 3. The terms of any lease issued hereunder shall not be varied nor shall any such lease be renewed except under the provisions of the lease, without the consent of the Government of the Province within which the area leased is situate.
- 4. A copy of each lease that is issued hereunder shall be at once sent to the Government of the Province interested in the same.
- 5. All rentals shall be collected by the Minister of Marine and Fisheries for Canada; but half the amount collected each year, ending the 1st day of May, in each Province, after deducting the cost of the pro-

### Proposed Modus Vivendi re Oysters

tection of the oyster fisheries therein, shall annually be paid over to the Government of such Province during the month of April following.

- 6. Where necessity therefor exists, in the opinion of the Government of any Province, areas shall be set apart and defined by the Minister, in which farmers may dig and take away what is known as "mussel mud."
- The Minister of Marine and Fisheries for Canada shall within three years from the date of this agreement, establish and maintain an artificial oyster bed in each of the two Provinces for the instruction of the public and to promote the artificial culture and cultivation of oysters. In each case the area selected shall be on a bottom that has not produced oysters in the past and shall not exceed five acres in extent. Immediately after the Minister has selected an area for the establishment of such oyster bed, he shall send to the Province interested a description of such area, which shall for the period of twenty years thereafter be subject to the exclusive control of the Minister of Marine and Fisheries of Canada for the time being; but the Minister shall have the right to lease such area for any balance of such term of twenty years that may remain after oyster beds have been established thereon, for such rental as the Minister may fix, and after deducting the cost of establishing such oyster beds and all other expenses incurred in connection therewith, the Minister shall pay over to the Government of the Province within which such area is settled the balance, if any, of the rentals received.

### SCHEDULE "A"

# GREEMENT made in duplicate this of A. D.

day

#### BETWEEN

His Majesty the King, represented by the Honourable

His Majesty's Minister of Marine and Fisheries for Canada,

### AND

(hereinafter called the lessee.)

Whereas under an agreement between His Majesty's Government of the Dominion of Canada and His Majesty's Government of the Province of , the Minister of Marine and Fisheries for Canada for the time being, has been empowered to grant leases of areas of the sea coast bays and rivers of the said Province for oyster culture, the said Government of the said Province while concurring in the issue of such leases and agreeing to confirm and support the same, expressly stipulating that it shall not be held to have in any way recognized the right of His Majesty's Government of the Dominion of Canada to any interest in the fisheries or in the lands so subject to lease for the purposes aforesaid;

And whereas the Minister has authorized the issue of a lease to the lessee of the lands hereinafter described, for an oyster fishery for the term of twenty years, renewable as hereinafter provided;

Witnesseth that His Majesty in consideration of the rent hereinafter reserved, and upon and subject to the stipulations, provisos and conditions hereinafter contained, doth hereby demise unto the lessee and assigns all and singular,—

To hold the same unto the lessee and assigns for and during the term of twenty years, to be computed from the 1st day of May, A.D. one thousand nine hundred and , and from thenceforth next ensuing and fully to be completed and ended.

Yielding and paying therefor each year during the first five years of the said term the sum of One Dollar per acre on the 1st day of May in each of the said five years, and on the 1st day of May during the next five years of the said term the sum of Three Dollars per acre, and on the first day of May in each year thereafter during the said term the sum of Five Dollars per acre, the first payment to be made upon or before the day of the execution of these presents, and it shall be in proportion to each of the following five as the number of months from the date of the issue of the lease is to twelve, it being agreed that the first year shall be deemed to end on the 1st day of May following the issuing of the lease.

Provided always and this agreement is upon and subject to the

following covenants and conditions:-

1. That the lessee shall and will pay the rent hereby reserved in manner aforesaid, and shall and will also pay all charges, taxes, rates and assessments whatsoever, which shall during the said term be charged upon or payable in respect of the demised premises.

2. And that it shall be lawful for the Minister or any person thereunto authorized by him, at all reasonable times during the said term, to enter upon the demised premises to examine the condition thereof.

3. And that the lessee shall not, nor will during the said term assign or underlet the demised premises or any part thereof, without the consent in writing of the Minister.

4. And that the lands hereby demised shall be used for the purposes

of oyster culture and for no other purpose.

5. The lessee shall as soon as possible after the 31st day of March in each year during the continuance of this lease, make a true return to the Minister, verified by statutory declaration, showing: (a) the quantity and kind of oysters planted; (b) the quantity taken; (c) the quantity sold in Canada, and (d) the quantity exported during the year ended on the said 31st day of March.

6. The lessee shall mark the boundaries of the lands hereby leased with suitable stakes or buoys and the number of the lot shall be plainly marked on such stake or buoy as may be selected by the Fishery Officer

for that purpose.

- 7. The lessee undertakes and agrees to establish and properly cultivate and maintain oyster beds within the area leased, the whole to the satisfaction of the Minister. If at any time the lessee should, in the opinion of the Minister, neglect to properly establish and cultivate oyster beds or should overfish the same, the Minister may forthwith cancel this lease. The lessee, moreover, undertakes to improve the area without undue delay, and if improvement to the satisfaction of the Minister has not been effected within one year from the date of the issue of the lease, the Minister may cancel the same.
- 8. The lessee shall at the expiry of the term hereby created deliver up possession of the area hereby leased and the oyster beds established thereon without any claim to remuneration or any indemnity.

- 9. The lessee shall not interfere with the operations of fishermen engaged in fishing for or catching any kind of fish other than oysters within the limits of the area hereby leased, provided such fishermen are not in any way injuring the oyster beds.
- 10. The lessee shall conform to the various provisions of the Fisheries Act and all Regulations made thereunder, and with all directions given by any Fishery Officer.
- 11. If the lessee shall up to the expiration of the term hereby granted pay the rent hereby reserved, and observe and perform all and every the covenants and conditions herein contained, and on

part to be observed and performed, and being desirous of taking a renewal lease of the said premises, shall of such desire give to the Minister six month's notice in writing previous to the expiration of the term hereby granted, His Majesty shall and will grant to the lessee a renewal lease of the said demised premises for the further term of twenty years, upon the same terms and containing the same stipulations, provisos and conditions as these presents, including this clause, except that the rent payable after such renewal may be a different sum; but it shall be payable in advance upon the 1st day of May in each year during the continuance of such renewal term.

- 12. If the rent hereby reserved, or any portion thereof, shall remain unpaid for the space of thirty days after the same should have been paid, whether payment thereof shall have been demanded or not, or if there shall be a breach by the lessee of any of the covenants or conditions herein contained and on the part of the lessee to be observed and performed then, and in any and every such case, it shall be lawful for His Majesty into and upon the premises hereby demised (or any part thereof in the name of the whole) to re-enter, and the same to have again, repossess and enjoy as of His Majesty's former estate therein, anything herein contained to the contrary notwithstanding, and thereupon these presents and everything therein contained shall immediately become and be null and void to all intents and purposes, except that no remedy available to His Majesty for the recovery of any rent or arrears of rent then due or accruing due shall be thereby in any way affected.
- 13. Where the context allows the expression "His Majesty" includes the heirs, successors and assigns of His Majesty. The expression "Minister" means the Minister and Acting Minister of Marine and Fisheries of Canada for the time being and includes the Deputy and Acting Deputy of the Minister, and the expression "lessee" includes the heirs, executors, administrators and assigns of the lessee.

# Proposed Oyster-B'ed Lease

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### APPENDIX

### ANNUAL CATCH OF

$\begin{array}{cccccccccccccccccccccccccccccccccccc$	YEAR	L. Ontario and Niagara R.	L. ERIE AND DETROIT R.	L. HURON AND GEORGIAN BAY d	L. Superior	Manitoba ani N.W.T.
1869         679,000         211,200         1,501,400         324,800						
1870         621,500         290,600         1,531,800         538,800						
1871         582,600         345,200         1,315,200         410,800						
1872         491,500         673,000         1,985,800         411,600            1873         855,129b         677,473         2,750,925         476,000            1874         496,947         1,643,400         2,524,400         516,000            1876         952,926         390,420         3,443,000         449,300         220           1877         509,050         264,000         2,986,800         509,800         335           1878         776,600         323,200         2,674,000         325,400            1879         786,900         436,800         1,788,900         85,800            1881         722,110         580,124         3,671,473         530,944            1882         307,634         358,345         2,691,585         413,572            1883         133,100         284,128         2,308,392         635,800            1884         191,900         299,753         2,376,494         564,950            1885         365,300         217,080         2,680,060         606,160            1886         236,749         156,14						
1873         855,129b         677,473         2,750,925         476,000		1				
1874         496,947         1,643,400         2,524,400         516,000	1872					
1875         808,400         413,600         3,512,800         261,400	1873	855,129b	677,473	2,750,925	476,000	
1876         952,926         390,420         3,443,000         449,300         220           1877         509,050         264,000         2,986,800         509,800         335           1878         776,600         323,200         2,674,000         325,400            1879         786,900         436,800         1,788,900         85,800            1880         845,500         516,100         2,819,000         354,800            1881         722,110         580,124         3,671,473         530,944            1882         307,634         358,345         2,691,585         413,572            1883         133,100         284,128         2,308,392         635,800            1884         191,900         299,753         2,376,494         564,950            1885         365,300         217,080         2,680,060         606,160            1886         236,749         156,143         2,402,249         847,160         3,180           1887         404,634         376,456         3,005,806         657,160         2,307           1888         329,620         489,9	1874	496,947	1,643,400	2,524,400	516,000	
1877         509,050         264,000         2,986,800         509,800         335           1878         776,600         323,200         2,674,000         325,400            1879         786,900         436,800         1,788,900         85,800            1880         845,500         516,100         2,819,000         354,800            1881         722,110         580,124         3,671,473         530,944            1882         307,634         358,345         2,691,585         413,572            1883         133,100         284,128         2,308,392         635,800            1884         191,900         299,753         2,376,494         564,950            1885         365,300         217,080         2,680,060         606,160            1886         236,749         156,143         2,402,249         847,160         3,180           1887         404,634         376,456         3,005,806         657,160         2,307           1888         329,620         489,906         5,213,538         932,180         2,904           1889         448,396         387	1875	808,400	413,600	3,512,800	261,400	
1878         776,600         323,200         2,674,000         325,400	1876	952,926	390,420	3,443,000	449,300	220,605
1879         786,900         436,800         1,788,900         85,800           1880         845,500         516,100         2,819,000         354,800           1881         722,110         580,124         3,671,473         530,944           1882         307,634         358,345         2,691,585         413,572           1883         133,100         284,128         2,308,392         635,800           1884         191,900         299,753         2,376,494         564,950           1885         365,300         217,080         2,680,060         606,160           1886         236,749         156,143         2,402,249         847,160         3,180           1887         404,634         376,456         3,005,806         657,160         2,307           1888         329,620         489,906         5,213,538         932,180         2,904           1889         448,396         387,383         5,262,178         896,000         2,610           1890         405,350         242,922         5,961,620         978,400         3,402           1891         603,030         368,499         4,541,680         966,465         5,162           1892         480,6	1877	509,050	264,000	2,986,800	509,800	335,460
1880         845,500         516,100         2,819,000         354,800	1878	776,600	323,200	2,674,000	325,400	
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1885         365,300         217,080         2,680,060         606,160            1886         236,749         156,143         2,402,249         847,160         3,180           1887         404,634         376,456         3,005,806         657,160         2,307           1888         329,620         489,906         5,213,538         932,180         2,904           1889         448,396         387,383         5,262,178         896,000         2,610           1890         405,350         242,922         5,961,620         978,400         3,402           1891         603,030         368,499         4,541,680         966,465         5,162           1892         480,600         335,950         6,241,206         783,640            1893         372,570         281,240         3,872,300         898,700            1894         220,930         170,593         2,697,036         1,055,533            1895         127,650         167,510         1,414,680         930,395            1897         292,460         299,990         1,090,036         713,075            1898         410,420	1884	191,900	299,753	2,376,494	564,950	
1887         404,634         376,456         3,005,806         657,160         2,307           1888         329,620         489,906         5,213,538         932,180         2,904           1889         448,396         387,383         5,262,178         896,000         2,610           1890         405,350         242,922         5,961,620         978,400         3,402           1891         603,030         368,499         4,541,680         966,465         5,162           1892         480,600         335,950         6,241,206         788,640            1893         372,570         281,240         3,872,300         898,700            1894         220,930         170,593         2,697,036         1,055,533            1895         127,650         167,510         1,414,680         930,395            1896         170,850         170,300         1,676,250         821,900            1897         292,460         299,990         1,099,036         713,075            1899         259,915         440,148f         1,679,160         623,229            1900         129,126	1885	365,300	217,080	2,680,060		
1887         404,634         376,456         3,005,806         657,160         2,307           1888         329,620         489,906         5,213,538         932,180         2,904           1889         448,396         387,383         5,262,178         896,000         2,610           1890         405,350         242,922         5,961,620         978,400         3,402           1891         603,030         368,499         4,541,680         966,465         5,162           1892         480,600         335,950         6,241,206         788,640            1893         372,570         281,240         3,872,300         898,700            1894         220,930         170,593         2,697,036         1,055,533            1895         127,650         167,510         1,414,680         930,395            1896         170,850         170,300         1,676,250         821,900            1897         292,460         299,990         1,099,036         713,075            1898         410,420         311,815         1,230,830         659,230            1899         259,915	1886	236,749	156,143	2,402,249	847,160	3,180,397
1888         329,620         489,906         5,213,538         932,180         2,904           1889         448,396         387,383         5,262,178         896,000         2,610           1890         405,350         242,922         5,961,620         978,400         3,402           1891         603,030         368,499         4,541,680         966,465         5,162           1892         480,600         335,950         6,241,206         783,640            1893         372,570         281,240         3,872,300         898,700            1894         220,930         170,593         2,697,036         1,055,533            1896         170,850         170,300         1,676,250         821,900            1897         292,460         299,990         1,099,036         713,075            1898         410,420         311,815         1,230,830         659,230            1899         259,915         440,148f         1,679,160         623,229            1900         129,126         422,146         1,557,455         461,546            1901         133,992         <						2,307,370
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1906     356,600     406,900     1,319,150     452,300						
1907         343,890         778,100         1,777,240         300,640            1908         795,797         880,489         2,086,543         362,587		1		, ,		
1908 795,797 880,489 2,086,543 362,587		1				
1909   1,155,547   2,717,557   1,216,126   469,886						
1910   694,109   1,451,700   1,164,997   281,470						

a Including the figures for inland waters of Frontenac county, which are so small as to be negligible.

b The statistics of the catch for the years 1873-1881 were expressed in pounds and pieces, but have been reduced to pounds.

c In 1868 the figures for the catch in lake Ontario as far as Whitby were included with those of lake Erie.

III
WHITEFISH, 1868-1910

Lake of Woods District	Manitoba and Keewatin	N.W.T.	Sask.	ALBERTA	YUKON	YEAR
						1868
						1869 1870
						1871
						1872
						1873
						187 <b>4</b> 187 <b>5</b>
						1876
						1877
						1878 1879
						1880
				j · · · · · · · · · · · · · · ·		1881
						1882
						1883 1884
						1885 1886
						1887 1888
						1889
						1890 1891
						1892
	4,354,013	11,435,092				1893
362,300	4,530,255	10,911,664		1		1894
449,280	3,416,698	6,707,150				1895
466,500	4,270,319	6,657,150				1896
552,860	4,573,660	5,221,100				1897
437,820	3,363,863	4,914,000				1898
274,540	3,361,141	4,310,800				1899
309,038	3,523,520	4,111,000				1900
117,576	5,872,400	3,832,000				190
234,864	7,207,600	3,339,000				190
263,975	7,914,500	3,514,500				190
330,940	9,100,000	2,193,500				190
326,920	9,400,000	2,462,040				190
397,910			1,884,000	1,615,000		190
388,200	1		2,196,000	968,100		190
612,000			1,095,000	776,000	en F00	190
694,347			1,743,000		69,500	190
697,728			1,930,000		162,632	190
903,556			2,149,000	1,072,100	148,400	191

d Including the catch in lake and river St. Clair.
e This is made up as follows: 3,561,235 lbs. for Manitoba, and 1,601,000 for the Northwest
Territories.
f From 1899-1910 inclusive, figures for the catch in lake St. Clair are given with those for lake Erie.

### APPENDIX IV

### DISTRIBUTION OF WHITEFISH FRY, 1876-1910

(Figures given in Millions.)

YEAR	LAKE HURON	LAKE ERIE	LAKE ONTARIO	LAKE WINNIPEG
		7	Not recorded <sup>a</sup>	
		7.75	•2	
		19.56	1	
1879		12	•5	* * * *
		13.5	•8	• • • •
1881		4	•8	• • • •
$1882^{b}$		19	1.27	• • • •
1883 b		35	2.15	• • • •
1884		25	4	• • • •
		43	1	* * * *
1886		33	7.15	* * * *
1887	2	19.5	5.37	• • • •
1888	4	24	4.4	• • • •
1889	.4	19	3.7	• • • •
1890	3	25	4.65	
1891	3.3	51		
1892	2.5	39	4.8	• • • •
1893	2.5	46	4.8	
894	3	42	4.9	
895	3	67	3.8	- 11
896	3		4.8	19
897	3	55	4.8	
898	3.9	66	4.8	* * * * *
899	4.3	65	4.9	9
900	4.55	66	5.05	20
901	4.9	64	4.8	15
902		60	4.5	
903	5	77	3	23
904	4	62	3	12
	3	44	4	31.5
905	4	72	4	25
906	4	55	4	
907	3	54	4.5	137
908	5	70	4	
909	19.5	62	4.5	130
910		71.5	4.5	130

<sup>&</sup>lt;sup>a</sup> From 1868 to 1875 small quantities of whitefish fry were distributed from the Newcastle hatchery, but the numbers and points of distribution cannot be obtained with any degree of accuracy.

<sup>&</sup>lt;sup>b</sup> The total distribution in lakes Erie and Ontario for these years can only be given approximately as the report of the Superintendent of Fish Culture is not available.

In 1910 forty million fry were planted in lake Winnipegosis.

### APPENDIX V

### CATCH OF SHAD IN CANADA, 1874-1910

1875       14,395       "         1876       10,447       "         1877       9,374       "         1878       11,992       "         1879       14,608       "         1880       10,846       "         1881       14,819       "         1882       10,323       "         1883       7,076       "         1884       7,737       "         1885       14,535a       "         1886       11,068       "         1887       11,883       "         1888       6,521       "         1889       5,719       "         1890       7,268       "         1891       8,428b       "         1892       9,989b       "         1893       7,708       "         1894       9,244       "         1895       9,639       "         1896       8,586       "         1897       10,886       "         1898       10,801       "         1900       8,353       "         1901       7,692       " <t< th=""><th>187412,342 b</th><th>arrels</th></t<>	187412,342 b	arrels
1876.       10,447         1877.       9,374         1878.       11,992         1879.       14,608         1880.       10,846         1881.       14,819         1882.       10,323         1883.       7,076         1884.       7,737         1885.       14,535°         1886.       11,068         1887.       11,883         1888.       6,521         1889.       5,719         1890.       7,268         1891.       8,428°         1892.       9,989°         1893.       7,708         1894.       9,244         1895.       9,639         1896.       8,586         1897.       10,886         1898.       10,801         1899.       10,707         1900.       8,353         1901.       7,692         1902.       7,548         1903.       10,036         1904.       7,301         1905.       6,265         1906.       5,902°         1907.       5,230         1908.       4,391		"
1877.         9,374           1878.         11,992           1879.         14,608           1880.         10,846           1881.         14,819           1882.         10,323           1883.         7,076           1884.         7,737           1885.         14,535a           1886.         11,068           1887.         11,883           1888.         6,521           1889.         5,719           1890.         7,268           1891.         8,428b           1892.         9,989b           1893.         7,708           1894.         9,244           1895.         9,639           1896.         8,586           1897.         10,886           1898.         10,801           1899.         10,707           1900.         8,353           1901.         7,692           1902.         7,548           1903.         10,036           1904.         7,301           1905.         6,265           1906.         5,902c           1907.         5,230		"
1878.       11,992       "         1879.       14,608       "         1880.       10,846       "         1881.       14,819       "         1882.       10,323       "         1883.       7,076       "         1884.       7,737       "         1885.       14,535°       "         1886.       11,068       "         1887.       11,883       "         1889.       5,719       "         1890.       7,268       "         1891.       8,428°       "         1892.       9,989°       "         1893.       7,708       "         1894.       9,244       "         1895.       9,639       "         1896.       8,586       "         1897.       10,886       "         1898.       10,707       "         1900.       8,353       "         1901.       7,692       "         1902.       7,548       "         1903.       10,036       "         1904.       7,301       "         1906.       5,902°       "		66
1879.       14,608       "         1880.       10,846       "         1881.       14,819       "         1882.       10,323       "         1883.       7,076       "         1884.       7,737       "         1885.       14,535°       "         1886.       11,068       "         1887.       11,883       "         1889.       5,719       "         1890.       7,268       "         1891.       8,428°       "         1892.       9,989°       "         1893.       7,708       "         1894.       9,244       "         1895.       9,639       "         1896.       8,586       "         1897.       10,886       "         1899.       10,707       "         1900.       8,353       "         1901.       7,692       "         1902.       7,548       "         1903.       10,036       "         1904.       7,301       "         1906.       5,902°       "         1907.       5,230       "		"
1880.       10,846       "         1881.       14,819       "         1882.       10,323       "         1883.       7,076       "         1884.       7,737       "         1885.       14,535°       "         1886.       11,068       "         1887.       11,883       "         1888.       6,521       "         1890.       7,268       "         1891.       8,428°       "         1892.       9,989°       "         1893.       7,708       "         1894.       9,244       "         1895.       9,639       "         1898.       10,801       "         1899.       10,707       "         1900.       8,353       "         1901.       7,692       "         1902.       7,548       "         1903.       10,036       "         1904.       7,301       "         1905.       6,265       "         1906.       5,902°       "         1907.       5,230       "         1909.       5,343       "		66
1881.       14,819       "         1882.       10,323       "         1883.       7,076       "         1884.       7,737       "         1885.       14,535°       "         1886.       11,068       "         1887.       11,883       "         1888.       6,521       "         1889.       5,719       "         1890.       7,268       "         1891.       8,428°       "         1892.       9,989°       "         1893.       7,708       "         1894.       9,244       "         1895.       9,639       "         1896.       8,586       "         1897.       10,886       "         1898.       10,801       "         1900.       8,353       "         1901.       7,692       "         1902.       7,548       "         1903.       10,036       "         1904.       7,301       "         1905.       6,265       "         1906.       5,902°       "         1907.       5,230       "		"
1882       10,323       "         1883       7,076       "         1884       7,737       "         1885       14,535°       "         1886       11,068       "         1887       11,883       "         1888       6,521       "         1889       5,719       "         1890       7,268       "         1891       8,428°       "         1892       9,989°       "         1893       7,708       "         1894       9,244       "         1895       9,639       "         1896       8,586       "         1897       10,886       "         1898       10,801       "         1900       8,353       "         1901       7,692       "         1902       7,548       "         1903       10,036       "         1904       7,301       "         1905       6,265       "         1906       5,902°       "         1907       5,230       "         1908       4,391       "         19		"
1883       7,076       "         1884       7,737       "         1885       14,535°       "         1886       11,068       "         1887       11,883       "         1888       6,521       "         1889       5,719       "         1890       7,268       "         1891       8,428°       "         1892       9,989°       "         1893       7,708       "         1894       9,244       "         1895       9,639       "         1896       8,586       "         1898       10,801       "         1899       10,707       "         1900       8,353       "         1901       7,692       "         1902       7,548       "         1903       10,036       "         1904       7,301       "         1905       6,265       "         1906       5,902°       "         1907       5,230       "         1908       4,391       "         1909       5,343       "		ш
1884.       7,737       "         1885.       14,535°       "         1886.       11,068       "         1887.       11,883       "         1888.       6,521       "         1889.       5,719       "         1890.       7,268       "         1891.       8,428°       "         1892.       9,989°       "         1893.       7,708       "         1894.       9,244       "         1895.       9,639       "         1896.       8,586       "         1897.       10,886       "         1898.       10,801       "         1899.       10,707       "         1900.       8,353       "         1901.       7,692       "         1902.       7,548       "         1903.       10,036       "         1904.       7,301       "         1905.       6,265       "         1906.       5,902°       "         1907.       5,230       "         1909.       5,343       "		"
1885.       14,535a       "         1886.       11,068       "         1887.       11,883       "         1888.       6,521       "         1889.       5,719       "         1890.       7,268       "         1891.       8,428b       "         1892.       9,989b       "         1893.       7,708       "         1894.       9,244       "         1895.       9,639       "         1896.       8,586       "         1897.       10,886       "         1898.       10,801       "         1899.       10,707       "         1900.       8,353       "         1901.       7,692       "         1902.       7,548       "         1903.       10,036       "         1904.       7,301       "         1905.       6,265       "         1906.       5,902c       "         1907.       5,230       "         1908.       4,391       "         1909.       5,343       "		"
1886       11,068         1887       11,883         1888       6,521         1889       5,719         1890       7,268         1891       8,428 <sup>b</sup> 1892       9,989 <sup>b</sup> 1893       7,708         1894       9,244         1895       9,639         1896       8,586         1897       10,886         1898       10,801         1899       10,707         1900       8,353         1901       7,692         1902       7,548         1903       10,036         1904       7,301         1905       6,265         1906       5,902 <sup>c</sup> 1907       5,230         1908       4,391         1909       5,343		66
1887       11,883       "         1888       6,521       "         1889       5,719       "         1890       7,268       "         1891       8,428b       "         1892       9,989b       "         1893       7,708       "         1894       9,244       "         1895       9,639       "         1896       8,586       "         1898       10,801       "         1899       10,707       "         1900       8,353       "         1901       7,692       "         1902       7,548       "         1903       10,036       "         1904       7,301       "         1905       6,265       "         1906       5,902c       "         1907       5,230       "         1908       4,391       "         1909       5,343       "		и
1888       6,521       "         1889       5,719       "         1890       7,268       "         1891       8,428 <sup>b</sup> "         1892       9,989 <sup>b</sup> "         1893       7,708       "         1894       9,244       "         1895       9,639       "         1896       8,586       "         1898       10,801       "         1899       10,707       "         1900       8,353       "         1901       7,692       "         1902       7,548       "         1903       10,036       "         1904       7,301       "         1905       6,265       "         1906       5,902 <sup>c</sup> "         1907       5,230       "         1908       4,391       "         1909       5,343       "		"
1889.       5,719       "         1890.       7,268       "         1891.       8,428b       "         1892.       9,989b       "         1893.       7,708       "         1894.       9,244       "         1895.       9,639       "         1896.       8,586       "         1897.       10,886       "         1898.       10,801       "         1899.       10,707       "         1900.       8,353       "         1901.       7,692       "         1902.       7,548       "         1903.       10,036       "         1904.       7,301       "         1905.       6,265       "         1906.       5,902c       "         1907.       5,230       "         1908.       4,391       "         1909.       5,343       "		и
1890       7,268       "         1891       8,428b       "         1892       9,989b       "         1893       7,708       "         1894       9,244       "         1895       9,639       "         1896       8,586       "         1897       10,886       "         1898       10,801       "         1899       10,707       "         1900       8,353       "         1901       7,692       "         1902       7,548       "         1903       10,036       "         1904       7,301       "         1905       6,265       "         1906       5,902c       "         1907       5,230       "         1908       4,391       "         1909       5,343       "		"
1891       8,428b       "         1892       9,989b       "         1893       7,708       "         1894       9,244       "         1895       9,639       "         1896       8,586       "         1897       10,886       "         1898       10,801       "         1899       10,707       "         1900       8,353       "         1901       7,692       "         1902       7,548       "         1903       10,036       "         1904       7,301       "         1905       6,265       "         1906       5,902c       "         1907       5,230       "         1908       4,391       "         1909       5,343       "		"
1892.       9,989b       "         1893.       7,708       "         1894.       9,244       "         1895.       9,639       "         1896.       8,586       "         1897.       10,886       "         1898.       10,801       "         1899.       10,707       "         1900.       8,353       "         1901.       7,692       "         1902.       7,548       "         1903.       10,036       "         1904.       7,301       "         1905.       6,265       "         1906.       5,902c       "         1907.       5,230       "         1908.       4,391       "         1909.       5,343       "		"
1893       7,708       "         1894       9,244       "         1895       9,639       "         1896       8,586       "         1897       10,886       "         1898       10,801       "         1899       10,707       "         1900       8,353       "         1901       7,692       "         1902       7,548       "         1903       10,036       "         1904       7,301       "         1905       6,265       "         1906       5,902°       "         1907       5,230       "         1908       4,391       "         1909       5,343       "		u
1894.       9,244         1895.       9,639         1896.       8,586         1897.       10,886         1898.       10,801         1899.       10,707         1900.       8,353         1901.       7,692         1902.       7,548         1903.       10,036         1904.       7,301         1905.       6,265         1906.       5,902°         1907.       5,230         1908.       4,391         1909.       5,343		"
1895.       9,639         1896.       8,586         1897.       10,886         1898.       10,801         1899.       10,707         1900.       8,353         1901.       7,692         1902.       7,548         1903.       10,036         1904.       7,301         1905.       6,265         1906.       5,902°         1907.       5,230         1908.       4,391         1909.       5,343		"
1896.       8,586         1897.       10,886         1898.       10,801         1899.       10,707         1900.       8,353         1901.       7,692         1902.       7,548         1903.       10,036         1904.       7,301         1905.       6,265         1906.       5,902°         1907.       5,230         1908.       4,391         1909.       5,343		66
1897       10,886       "         1898       10,801       "         1899       10,707       "         1900       8,353       "         1901       7,692       "         1902       7,548       "         1903       10,036       "         1904       7,301       "         1905       6,265       "         1906       5,902°       "         1907       5,230       "         1908       4,391       "         1909       5,343       "		"
1898.       10,801         1899.       10,707         1900.       8,353         1901.       7,692         1902.       7,548         1903.       10,036         1904.       7,301         1905.       6,265         1906.       5,902°         1907.       5,230         1908.       4,391         1909.       5,343		"
1899.       10,707         1900.       8,353         1901.       7,692         1902.       7,548         1903.       10,036         1904.       7,301         1905.       6,265         1906.       5,902°         1907.       5,230         1908.       4,391         1909.       5,343		46
1900.       8,353         1901.       7,692         1902.       7,548         1903.       10,036         1904.       7,301         1905.       6,265         1906.       5,902°         1907.       5,230         1908.       4,391         1909.       5,343		"
1901.       7,692         1902.       7,548         1903.       10,036         1904.       7,301         1905.       6,265         1906.       5,902°         1907.       5,230         1908.       4,391         1909.       5,343	19008,353	"
1902.       7,548         1903.       10,036         1904.       7,301         1905.       6,265         1906.       5,902°         1907.       5,230         1908.       4,391         1909.       5,343		"
1903       10,036       "         1904       7,301       "         1905       6,265       "         1906       5,902°       "         1907       5,230       "         1908       4,391       "         1909       5,343       "	1902	"
1904.       7,301       "         1905.       6,265       "         1906.       5,902°       "         1907.       5,230       "         1908.       4,391       "         1909.       5,343       "		"
1905.       6,265       "         1906.       5,902°       "         1907.       5,230       "         1908.       4,391       "         1909.       5,343       "	1904	"
1906. 5,902° " 1907. 5,230 " 1908. 4,391 " 1909. 5,343 "	1905	"
1907. 5,230 " 1908. 4,391 " 1909. 5,343 "	1906 5,902°	"
1908	1907	"
1909 5,343 "		"
~ ~		
	~ ~ ~ ~	"

<sup>&</sup>lt;sup>a</sup> The figures given here for 1885 and prior years do not include the catch of Quebec, which, in the statistics published by the Department of Marine and Fisheries, is given in "pieces" instead of "barrels."

# Catch of Shad in Canada

The shad catch of Quebec from 1874 to 1885 inclusive has been as follows:

1074																																			
1874	۰	۰	٠	۰	٠	٠		۰	•	۰	٠			٠	۰	٠	٠				٠				 			6	6	۶,	37:	3	pi	ec	es
1875			٠	٠						٠	٠		 	۰	٠	٠				ě							]	3	4	, (	99:	2	•	66	
1876																																		ш	
1877																																		66	
1878																						 						2	7	, (	33	3		66	
1879												 										 	. ,	, ,				5	5	, :	8	5		"	
1880																																		к	
1881												 										 					1	16	3,	g	77	7		"	
1882							p					 														۰	2	2	5,	8	54	1		æ	
1883																																		cc	
1884																																		66	
1885																											1	4:	3	3	20	)		αε	



b Pickled only.

2 Approximately; value figured at \$10 bbl., only the value being given in the Report of the Department of Marine and Fisheries.

### APPENDIX VI

## RECOMMENDATIONS OF DOMINION SHAD FISHERY COMMISSION

THE restoration of the shad supply to something like its former condition is the great object of the work of this Commission. With the view of accomplishing this end with the least possible friction to existing interests and to restore as speedily as possible this valuable and important fishery; and to save it from that total and complete extermination which now threatens it, we beg to submit our recommendations, with added observations thereon.

These recommendations were, in the main, briefly set forth in our interim report presented to the Honourable the Minister, on February 6, 1909, and which report is appended hereto; but the grounds for our recommendations were not fully set forth therein. Before proceeding to indicate the grounds referred to, we would again direct attention to the desirability of establishing hatcheries and of restoring the supply of shad by the modern methods of fish culture which have proved so successful in the United States. In the course of our tour as a Commission, we have found in various localities that most favourable conditions exist for successfully conducting the work of the propagaation of shad, and we are of opinion that if vigorous action is taken, along the lines of the recommendations herein submitted, the depleted shad fisheries can, we have confidence, be restored in a period of three Moreover, the cost of building shad hatcheries and of operating them appears to be much less than is the case with the hatching of salmon and other species of fish. Hatchery buildings need not be expensive, and the hatchery plant and the labour necessary are less costly than in the case of salmon, whitefish, &c., especially as the period during which it is necessary to carry on hatchery operations is comparatively short.

We preface our recommendations by urging that in official statistics shad should be reported as counted by the hundred, or by pounds as in the case of salmon. When recorded in barrels the totals are misleading, as already pointed out under the heading 'Prices of Shad.'

Various other kinds of fish are taken by the fishermen when fishing for shad and salmon, and these should be reported on separate lines in the returns which the fishermen are required to make to the local officer. In the form we suggest (see Appendix 7) six blank lines are

a See p. 196.

provided, on which to enter 'other fish,' such as cod, pollock, striped bass, dogfish, sturgeon, &c. Apart from the statistical value of these details, such returns afford information as to the increase or decrease of injurious fishes, like the dogfish, &c.

I. With reference to our Recommendation No. I, confining shad nets to tidal waters only, we may say that in the evidence given at our sittings it was clearly proven that shad, when frequenting waters other than tidal waters, are either ascending to spawn or actually engaged in spawning or descending in a foul, unclean condition after having spawned, and should not be captured. The schools of very small shad, it is stated, descend during the late summer and in the fall and the prohibition protects these shad when they should not be captured, and the small immature shad as well. Important dealers who appeared before the Commission declared that shad after spawing were unfit for food, and in the course of business, they would not purchase or handle them.

The exception which is applied in our report to St. John river and its tributaries takes into account the peculiar conditions which surround the weir fishery in St. John harbour, regarding which St. John city has special and exceptional prerogatives, and also with regard to Recommendation No. II, which is applicable generally, and under which shad and salmon fishing would be prohibited from August 15 in one year to July 1 in the year following, for three years following the adoption of these regulations submitted. It must be observed that, under these conditions, salmon nets of the mesh of  $6\frac{1}{2}$  inches extension measure may be used from March 1 to August 15 in each year.

II. This recommendation, No. II, will, in a great measure protect shad by confining fishing operations to  $1\frac{1}{2}$  months, viz.: July 1 to August 15, for a period of three years. Moreover, the mesh of salmon nets provided, viz.:  $6\frac{1}{2}$  inches, from March 1 to August 15, will not take shad but will allow salmon fishing to be carried on with the mesh specified.

III. We have in this suggested regulation recommended the adoption of the terms used in subsection 14 of section 47 of the Fisheries Act, chap. 45, 1906, so that instead of sunset and sunrise we recommend that the terms be low water nearest 6 o'clock in the morning and evening, the terms thus used in the Act and in the fishery regulations under the Act will then as far as possible be uniform.

IV. In this proposed regulation the provision of a fish gate, as already required by a special regulation in the fishery laws for Digby county (Nova Scotia Special Regulations, 1907, section 20, subsection

3), is made general in New Brunswick and Nova Scotia in the area within which, by our recommendations, weirs would be permitted. The Commission is aware that the department nearly twenty years ago took steps in this direction by requiring fish escapes in all weirs in St. John harbour. (Order in Council, June 6, 1892.)

V. This recommendation adopts the words of the existing regulation (Nova Scotia Regulations, section 20, subsection 10 and 11), except that instead of permitting all kinds of fish to be so dipped, gaspereau or alewives only are permitted, in order to protect shad and salmon. This recommendation has been already enforced in Shelburne county (Nova Scotia Regulations, section 20, subsection 18).

VI. The Commission found that different lengths of nets have been used in shad fishing. For example, in Nova Scotia the length used ranges from 600 fathoms down, while in New Brunswick the maximum length used appears to have been about 250 fathoms. The regulation now suggested establishes a uniform maximum length, about 300 fathoms, or a quantity not exceeding fifteen bunches of twine, during the three years specified in Recommendation No. II.

VII. In order to hasten the restoration of the shad fishery and to enable the protective steps suggested to be effectively carried out, the present lax method under which fishing is carried on should be replaced by some method of issuing a permit. Under such a system, all fishermen entitled to engage in the shad fishery would be enabled to carry on their operations under the permit with conditions specified. This recommendation is made in order to avoid promiscuous and unlimited fishing during the years when the attempt is being made to restore to their former plenitude the shad of the bay of Fundy. The salmon fishery, in our opinion, should be also included in this recommended step. (See our suggested regulation 19h.)

VIII. This recommendation appears to us essentially necessary to ensure the success of the shad hatching operations recommended. Were the reserves established which we recommend, supplies of parent shad could be obtained in the waters mentioned, and as these reserves provide all the most favourable conditions for successful planting of fry, they should be extensively stocked with young shad from the hatcheries, so that the waters of the bay may be benefited and the schools of shad restored to abundance as rapidly as possible.

IX. The Commission are convinced that the measures here recommended would be futile and without result were the wholesale destruction of shad by brush weirs, stake seines, &c., to continue in the area referred to, as in former years. During the three years specified, the

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stationary engines named should be closed down, in view of the enormous catches made by them and the fact that all sizes were in former years captured, both mature and immature. At the present time, the fishing of these stationary engines is unremunerative and fishermen actually engaged in this fishing have urged, as is seen in the evidence, the closing down of weirs, seines, &c.; but set nets, which gill the fish, would of course continue and no harmful results can follow, as the 5-inch mesh will not take small, immature fish.

It will be observed that the weir prohibition does not apply to St. John harbour or to the Nova Scotia shore, west of Stephen Bennett bay, the special reason being that the shad are not taken by weirs in the localities mentioned, to any extent, while the salmon fishery has been so extensively carried on, and is of such an important and profitable nature, that the same reasons for prohibition do not exist, so far as shad protection is concerned, as exist farther up the bay. The weirs in Digby basin are permitted under our recommendation, because the chief catches are herring, haddock and other fish, that is, fish other than shad or salmon.

From the evidence brought before us and from the authorities which we quote in this respect, the St John river has been pre-eminently the source of supply of shad for the bay of Fundy waters. It is, therefore, in the highest degree necessary that the shad ascending to spawn should be given every possible protection to enable them to reach their breeding grounds, especially by the prohibition of net and weir fishing where it interferes unduly with the ascent of the shad. In St. John harbour such prohibition is not called for, as the shad are not taken, except to a small extent, by the harbour weirs, which mainly take salmon and other fish.

X. This recommendation aims simply to make uniform the permission to use dip nets in Lequille river or Allen brook, as well as Round Hill river.

XI. The amendment here suggested is necessary, as the geographical limit at present defined is a disadvantage in the protection of the shad schools ascending the Shubenacadie river.

XII. Respecting the increased patrol which we so strongly urge, we may say that our statements in the interim report are self-explanatory and need no expansion now.

Our recommendations Nos. XIII, XIV, XV, XVI, and XVII do not require extended explanation, as the imperative necessity of shad hatcheries has been already fully dwelt upon in the body of this report, while the desirability of giving greater publicity to the regulations, by

means of linen posters prominently displayed in the fishing localities requires no argument. It is desirable, as suggested in Recommendation No. XV, that the meaning of "foul" and "unclean" in the Fisheries Act and regulations under it should be clearly defined, and also that "shad" should be more prominently mentioned in the Act, inasmuch as salmon, trout, cod, lake whitefish and other species receive prominent mention in some clauses in the Act.

Again, Recommendation No. XVII, referring to dams and obstacles to the ascent of fish, sawdust pollution, &c., is a recommendation of supreme importance and requires urgent attention. The harm arising from sawdust, we have dealt with in the body of the report. Flagrant cases of the obstruction of shad and salmon rivers by dams came prominently to our notice in the course of our investigations, and some notable examples call for mention, especially such a huge obstruction, 50 feet high, as that on Salmon river, nine miles above Truro and adjacent to Union station. This productive salmon river has been, in recent years, most seriously damaged on account of this obstruction, and as the evidence showed, the main cause of the decline of the fishery was attributed by witnesses to this cause. Other examples could be named of obstructions on important rivers.

Finally we would call attention to the verbal and other changes in the existing regulations, which we refer to in detail in the last portion of the interim report under Nos. XV, XVIII and XIX. Such changes are rendered necessary by the recommendations hereby made.

#### CONCLUSION

In conclusion, we have only to add that, in one form or another, the restoration of the great shad fisheries of the bay of Fundy, so important in former years to the whole resident population, has been before the Department of Marine and Fisheries for over a quarter of a century. Indeed almost from the earliest official reports published by the Department of Marine and Fisheries, attention has been called to the lack of effective regulations respecting this important fishery, and in recent years the marked decline of this industry has brought about a crisis which can only be met by such measures as those we have recommended in the foregoing report and in the interim report appended hereto.

Our recommendations, we believe, will be effective with the least amount of friction to the various interests concerned and with the least loss to those actually engaged in the fishery. The consensus of opinion brought out by the evidence, has demonstrated that the time has arrived when some remedial legislation must be authorized and enforced to prevent the total depletion of this fishery, which was once so prosperous and remunerative. Wherever local interests may appear to be affected by our suggested regulations, we have made recommendations, first of all, to restore the fish to plenitude, and secondly, to avoid unfair or unnecessary discrimination against any locality or any resident parties interested in the industry.

We have attempted to make as full and thorough a survey of the shad fisheries of the bay of Fundy as was possible and as appeared necessary, and we have also paid attention, in the course of our work and in accordance with our instructions, to the salmon and gaspereaux fisheries, and we have aimed to reach just and true conclusions which we have embodied in our recommendations.

All of which is respectfully submitted.

(Signed) SIMON MELANSON
SAMUEL F. MORRISON
Commissioners
EDWARD E. PRINCE
Chairman of the Commission

Оттама, Мау 28, 1910.

#### RECOMMENDATIONS OF INTERIM REPORT

In view of the condition which now exists and abundantly established by the mass of evidence received at the sittings of the commission, we submit a first series of the recommendations which we regard as urgent and calling for immediate sanction.

Various causes have no doubt combined to bring about the present serious condition of the shad fishery. Amongst these may be mentioned:—

- (1) Dams and other obstructions in rivers, preventing the parent fish from ascending to their spawning grounds.
  - (2) Catching the breeding fish when ascending the river to spawn.
  - (3) Overfishing by seines, weirs and nets.
- (4) The pollution of rivers and feeding grounds by sawdust and mill refuse and other deleterious substances, one of the most flagrant cases being the Kennetcook river, Hants county, at one time a fine shad and salmon river.

The recommendations we beg to make are as follow:—

#### I. Shad Nets in Tidal Waters Only

The use of nets and other apparatus for the capture of shad shall be confined to tidal waters only. Except that the St. John river, New Brunswick, and its tributaries nets only shall be allowed above the Reversible falls, and nets and other apparatus below the said falls.

(We note that the Fisheries Act, Sect. 16, applies to salmon only.)

# II. Annual Close Time for Shad and Salmon and Open Season for Salmon Nets of 6½-inch Mesh

The use of nets for the taking of shad and salmon to be probihited from August 15 to July 1, in the year next following, and during three consecutive seasons thereafter, provided that salmon nets of a mesh not less than  $6\frac{1}{2}$  inches extension measure may be used from March 1 to August 15.

# III. Weekly Close Time for Salmon, Shad and Gaspereau

From the time of low water nearest six o'clock in the afternoon of every Saturday to the time of low water nearest six o'clock in the forenoon of every Monday no one shall fish for, catch or kill salmon, shad or gaspereau in tidal waters, excepting in the estuary and waters of the Port Medway, &c. (Vide N. S. Fishery Regs. Sec. 10, ss. 2.)

### IV. Gates in Brush Weirs

In the waters of the bay of Fundy all brush weirs, of whatever description, shall be provided with gates, placed in the hurdle or deepest place; such gates to have an opening of at least eight feet in length by four feet in height, hinged at the top with iron straps, and provided with sufficient tackle attached to an upright timber, so that said gates may be raised at any time of tide. There shall be gates as above described for every one hundred and fifty feet of weir; but in every case these shall be placed as above directed in the deepest water. These gates shall be opened at or before six o'clock on every Saturday night, and remain open until Monday morning at six o'clock.

To prevent the destruction of young fish, every owner, occupier or person in charge of a weir shall, either by himself or by those employed under him, enter his weir in a boat before half tide ebb, ascertain the quality of the fish taken, and if young, or small, shall immediately open the gates to permit the fish to escape.

### V. Dipping Privileges in Digby County

Owners of land along any falls in any of the rivers of the county of Digby shall be allowed one stand for dipping gaspereau only, to be selected by the owners and pointed out to the overseer, who shall determine what claims they are entitled to, and to hold the same as their fishing privileges.

When the width of any falls shall exceed twenty feet, any person, except the owner of the stand, may anchor a boat in said falls for the purpose of dipping gaspereau only; provided that he does not interfere with the special privilege of owners of stands; and every boat so moored shall, after loading, make room and give place for others, by removing when requested to do so; and to prevent the intent of this clause from being defeated, no such fish shall be salted in any such boat nor any such fish shifted from one boat to another. When the river is less than twenty feet wide, no boat or craft of any kind shall be allowed to occupy any such public privilege in said river the second or any subsequent time until each man requesting the privilege shall have had his turn.

#### VI. Mesh and Length of Shad Nets

- (a) The meshes of nets for capturing shad shall be not less than 5 inches extension measure, and nothing shall be done to practically diminish their size.\*
- (b) The said nets shall not exceed fifteen bunches of twine or about three hundred fathoms in length.

#### VII. Shad and Salmon Fishing Permit

During the three years specified for the operation of these regulations every person engaging in shad and salmon drifting shall annually obtain a permit issued, without fee, by the local fishery overseer, one of the conditions of which is that the applicant therefor shall have previously engaged in fishing and be possessed of the necessary gear and shall render at the close of each fishing season on or before September 30 in each year, a true and accurate return of his catch of fish on an official form to be obtained from the said fishery overseer.† The second condition shall be that under each permit not more than one boat and net shall be used in the fishery and not more than one permit shall issue to each party.

<sup>\*</sup> The Commission recommends that the local fishery officer be empowered to permit nets of a smaller mesh, already in use, to be used until worn out.

 $<sup>\</sup>dagger$  Salmon nets not less than  $6\frac{1}{2}$  inches extension measure should be allowed, as heretofore, from March 1st, in each year, for which a permit should issue in addition to the shad and salmon permit specified in Recommendation No. 7.

A third condition shall be that each permit shall bear a distinctive number and this number shall be marked on every net buoy, and on every tablet securely attached to each net fished by the holder thereof.

Note—In Annapolis county the following regulation is in force under sec. 16 of the regulations

(6) Every net-buoy shall have the name of the owner, and the number of his fishery upon it, either in red letters or branded with hot iron; and every net shall have a tablet securely attached to it, with the name and number of its owner upon it, as above.)

# VIII. Reserves for the Propagation of Fish

That in accordance with the power vested in the Honourable the Minister by section 65 of the Fisheries Act, chapter 45, the following rivers shall be set apart for the propagation of fish, viz.:—

- (1) The Annapolis and Nictau, above a line drawn across the Annapolis river 100 feet below Bridgetown bridge.
  - (2) The Gaspereau river from its mouth or outlet.
- (3) The Avon river above a line drawn from Avondale landing to Youngs wharf in Falmouth.
- (4) The Shubenacadie river, from a line drawn across the river 100 feet below the bridge at Shubenacadie village.
- (5) The Stewiacke river above a line 100 feet below Dickey's mill-boom at the Intercolonial Railway bridge.
- (6) The Petitcodiac river, above a line drawn across the river 100 feet below Coverdale and Moncton bridge.

# IX. Prohibition of Weirs, &c., in Chignecto and Minas Waters

That all weirs of brush, wire or net and all seines be prohibited above an imaginary line drawn from the county line between St. John and Albert counties, New Brunswick, to cape Chignecto, Nova Scotia, and thence to cape D'Or and continuing to cape Split, thence by a straight line drawn from cape Split to Stephen Bennett's bay.

### X. Permit Two Days Dip-netting each Week in Lequille River as in Round Hill River

That subsection 8 of section 16 of the Nova Scotia regulations be amended by the insertion after the words 'Round Hill river' of the words 'and Lequille river or Allens brook' so that dip-netting shall be permitted on Wednesday and Thursday in each week on both rivers.

# XI. Shubenacadie Waters to Include Grand Lake and Upper Waters

That the waters of Shubenacadie river instead of being limited by Halifax county line as provided by subsection 1 (a) section 18 of the

Nova Scotia regulations shall be extended to include Grand lake and all the head waters of the Shubenacadie river, and the clause (a) be amended accordingly.

#### XII. Increased Fishery Patrol

To ensure the proper protection of the fish on the spawning grounds an increased patrol service is absolutely necessary. It is desirable that active special officers, not resident in the locality apportioned to them but brought from other districts, should be appointed in five important areas for May and June in each year, viz.:—

- (1) Annapolis river.
- (2) Shubenacadie and Stewiacke rivers.
- (3) Petitcodiac river (above Salisbury bridge).
- (4) Kennebecasis river and Hammond river.
- (5) Washademoak and Grand lakes and St. John river, New Brunswick.

The officers on the Kennebecasis river and Washademoak lake should be provided with gasoline launches or they cannot carry out an effective patrol. Minor fishery officers whose duties will be less urgent and exacting should be appointed to patrol in the fall each year the following rivers:—

- (1) Gaspereau river.
- (2) Salmon river.
- (3) Great Village river.

The fishery overseers and guardians hitherto authorized have not effectively protected the shad, gaspereau and salmon, and it is desired that they be required to more actively enforce the law, and with the aid of the additional special patrol officers now recommended the restoration of the valuable fish named will be more rapidly accomplished.

### XIII. New Hatcheries and Extended Shad-hatching

With the protection of the spawning fish a larger supply of eggs, especially of the shad, will be ensured for hatchery purposes, and we strongly recommend that shad-hatching at the Windsor hatchery, Nova Scotia, be extended and that shad eggs be hatched at the Bedford hatchery for stocking the Shubenacadie river, while a floating hatchery would be appropriate for the St. John river and might be located at Jemseg and moved to other points season by season. A cheap scow could be hired or purchased at St. John and a house at a small cost erected thereon, and if located close by the spawning grounds of the shad, abundant supplies of eggs could be relied on, and the fry planted in the immediate locality. An admirable site for a shad hatchery exists near Middleton and a cheap building could be erected there for stocking the

Nictau and Annapolis waters. There are several creeks at the head of St. Mary bay formerly resorted to by shad and these could be stocked from the above suggested hatcheries.

### XIV. Regulations on Linen to be Prominently Displayed

It is desirable that the regulations for the shad, salmon, &c., be printed on strong linen cloth, and posted in conspicuous places along the banks of the waters here reported on, also at post offices, &c. We find that the fishermen are not familiar with the regulations, and violations occur very frequently in ignorance of the law.

#### XV. Meaning of Foul and Unclean Fish

The existing uncertainty as to the exact meaning of 'foul and unclean' salmon is a source of difficulty. We recommend that more explicit terms should be used and that shad should be included in such a prohibition as section 13 of the Fisheries Act, chapter 45.

#### XVI. Shad Should be Named in the Act

It is a grave omission that so important a fish as the shad should be named in the Fisheries Act only in such a clause as sec. 47 ss. 8, rather than in section 43 of the Act, and the omission has created the impression that the shad is unimportant from an official point of view, whereas it is commercially of high importance.

#### XVII. Dams and Rubbish Obstructions

Notwithstanding that the Fisheries Act, chapter 45, section 46, provides that fishways shall be constructed in dams where the minister so decides, there are numerous streams resorted to by spawning shad, salmon and gaspereau, that are more or less seriously obstructed and the fish prevented from reaching their breeding grounds. In some instances accumulations of rubbish, old brush fences, stakes, &c., form obstacles to the ascent of the fish and these should be removed by the local fishery officers. In the case of the Nine Mile river, a tributary of the Shubenacadie river, we find that large schools of shad ascend each season and spawn, but the river after they pass up, dries, and great quantities are destroyed, and we recommend that about May 1 a fence of wire netting be erected across the mouth of this river so that the fish will be directed up the main Shubenacadie river, where extensive spawning grounds exist.

XVIII. Substitute 'Gaspereau or Alewives' for 'Fish.' (N. S. Regulations)

Section 20, subsection 10 and 11 which specify 'fish' in general terms should be altered so as to apply only to 'gaspereau or alewives.'

This is necessary in view of our protective recommendations for shad and salmon.

The subsections read as follows:-

- '10. Owners of land along any falls in any of the rivers of the county of Digby shall be allowed one stand for dipping fish, to be selected by the owners and pointed out to the overseer, who shall determine what claims they are entitled to, and to hold the same as their fishing privilege.
- '11. When the width of any falls shall exceed twenty feet, any person, except the owner of a stand, may anchor a boat in said falls for the purpose of dipping fish. Provided that he does not interfere with the special privilege of owners of stands; and every boat so moored shall, after loading, make room and give place for others, by removing when requested to do so; and to prevent the intent of this clause from being defeated, no fish shall be salted in any such boat nor any fish shifted from one boat to another. When the river is less than twenty feet wide, no boat or craft of any kind shall be allowed to occupy any such public privilege in said river the second or any subsequent time until each man requesting the privilege shall have had his turn.'

#### XIX. Shad-drifting Prohibition Confined to Avon River

In section 23, subsection 2 of the Nova Scotia regulations (p. 21) which reads as follows:—

'2. No drifting for shad shall be allowed in the Avon river, inside of a straight line drawn from Avondale landing to Youngs wharf in Falmouth, and no drifting for shad shall be allowed above Salter's head, in the Shubenacadie river, from the 1st day of June to the 30th day of September.'

after the words 'in Falmouth' the concluding clause, 'and no drifting for shad shall be allowed, &c.' should be omitted. Our Recommendation No. 2 allows shad drifting from July 1 to August 15 in Shubenacadie river up to Shubenacadie bridge.

We have only to add that certain sections of the fishery regulations for Nova Scotia and New Brunswick are affected or in some cases would be annulled by the new regulations which we have recommended in this interim report.

(a) Thus section 11, clause (a), p. 4, of the New Brunswick regulations which reads as follows:—

'Section 11, Shad and Gaspereau,

(a) The close time for shad and gaspereau shall extend from sunset on Friday evening in each week to sunrise on Monday morning following, during which time it shall be unlawful to fish for, catch or kill any shad or gaspereau. The fisheries within the harbour of St. John are, however, exempted from the foregoing provisions of this section,'

would be amended by our recommendation that the close time be

Saturday evening to Monday morning.

(b) That section 11, clause c, establishing a close season for shad and gaspereau after June 30th is cancelled by our recommendation. It is really a useless and unnecessary prohibition.

(c) That section 9, ss. (c), p. 4, shall not apply to the waters of Chignecto bay, Minas basin and Cobequid bay. This subsection reads

as follows:-

'(c) The owner or owners of any net or nets used for the purpose of taking salmon shall, on receiving such license, pay an annual license fee of three cents for each fathom of net so licensed, which license fee shall be paid to the local fishery overseer, for transmission to the Department of Marine and Fisheries.'

As a matter of fact this license has not been enforced in the waters

mentioned.

(d) Sec. 19, subsections 3 and 4 which read as follows:-

'3. Nets for taking shad shall not exceed (except at Port Laurence) twelve fathoms in length, and the meshes of such nets shall in no case be less than four and one-half inches, extension measure.

'4. Shad shall not be fished for in any of the rivers or bays of this county, by any mode of fishing, later than the 31st day of

August,'

would be amended by our recommendations which increase the size of mesh to 5 inches extension measure, and prohibit fishing after August 15.

(e) Sec. 24, subsections 1 and 2 would be rescinded by our recommendation for prohibiting all nets in rivers named.

The section reads as follows:-

'1. Gaspereau shall not be taken or caught in any part of the Gaspereau river, above a line between the properties of Mr. Stewart and Fredk. Annand, situated about three-quarter miles above Fuller bridge, otherwise than in a square net, and dipping and drifting for salmon and gaspereaux is prohibited.

- '2. No square net shall be used in the Gaspereau river, or any branch or tributary thereof, of a greater size than twelve feet square, and the mesh of any seine used below Fuller bridge shall not be less than two and a half inches.'
- (f) Sec. 24, subsection 10, Nova Scotia regulations, is annulled by the prohibition of weirs which we recommend. The subsection reads as follows:—
  - '10. In the herring fishery of Medford and Pereaux, each brush weir shall have at least two hundred feet of seine, of not less than two inches straight mesh in the 'bunt,' to allow the small fish to escape; and no seine or weir shall be so far finished as to catch before the 1st day of May in each year.'
- (g) We may add that while the above prohibition of weirs and seines affects certain special area and in Scott bay, Kings county, section 24, subsection 9 (N. S. Regs.) applies prohibiting drift netting for shad inside of a straight line drawn from cape Split to Stephen Bennett's bay, this does not interfere with set-nets of 5 inches mesh extension measure or with lines for trawl fishing.
- (h) Finally we call attention to the fact that the Fisheries Act, chapter 45, section 19, prohibits salmon drift-netting in Canada, excepting in New Brunswick and British Columbia, but salmon have been taken by drift nets for over fifty years when drifting for shad, and it is in Nova Scotia a recognized fishery, but not licensed. This fishing it would be difficult to stop and the only feasible course is to legalize it under a permit.

The whole of which is respectfully submitted.

(Signed.)
SIMON MELANSON 

SAMUEL F. MORRISON 

Commissioners

EDWARD E. PRINCE

Chairman of the Commission

Ottawa, February 6, 1909.

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